Electrical World

The consolidation of ELECTRICAL WORLD AND ENGINEER and AMERICAN ELECTRICIAN.
Published by McGraw Publishing Company, Inc.

Vol. 64 NEW YORK, SATURDAY, SEPTEMBER 12, 1914 No. 11

National Foreign Trade Council

The National Foreign Trade Council was formed at an opportune moment. In the year when there was the most need for the work that it could do it came into being. It is designed to act in behalf of manufacturers on the large questions of policy in reference to export trade. Its sphere of usefulness is like that of both a public policy committee and a promotive organization, although it has nothing to do with detail matters of selling. The extent of its membership, comprising thirty-five representatives of large corporations, is significant of its purpose. It is not intended to supplant any existing organizations but to work with them for the progress of all policies, legislative and otherwise, that make for better export trade. Bankers and many elements of the manufacturing industries of the country, including the electrical industry, have representation in the council, so that its labors touch a wide range of activities. The council, through Mr. James A. Farrell, its president, and various other members, has tried to persuade the Washington authorities to act so as to encourage foreign trade, and by so doing it has done a valuable service for all American industries. It is too much to expect that any organization can build up an export business for companies which have long been neglectful of possibilities in that direction, but it can do a great deal to produce wholesome conditions that will help the growth to follow lines of permanent strength and profit. The fortunate circumstance, of which all business interests have the benefit, is that this new influence was formed to make itself felt in this year of revelation and promise for export trade.

Gas and Oil Engines as Auxiliaries

A paper by Mr. Reginald Trautschold in the current issue will bear careful reading. It is directed toward that always insistent problem which confronts the central-station operator of how to deal with his peak-load conditions. The gas engineer has an immense advantage over the electric man in the indefinite amount of cheap storage of output at his command. Many a central-station manager has looked lovingly and enviously at the towering holder of his competitor. Mr. Trautschold discusses the possible advantage resulting from combining gas or oil engines with an ordinary steam plant, the latter being worked for the steady load and the former held available for meeting the requirements of the peak. Of course, there are conditions of fuel supply which would throw the balance of economy in favor of one or the other, but the point of the author's contention is that there are conditions under which combination may yield a more economical result than would be possible with either prime mover used separately. The same problem arises in case natural gas is available or a producer-gas plant auxiliary can be used. The whole matter turns on the economy of internal-combustion engines in operation for this purpose, as compared with that of steam units held in reserve to an extent which allows the load to be carried during the peak either by adding units or by forcing to the utmost those already in use. Ordinarily, under reasonably good fuel conditions, most engineers would prefer to use a homogeneous steam plant. Mr. Trautschold's figures show that there are cases in which combination plants may present advantages from one standpoint or another. One of the most important features of the internal-combustion engine is the extreme quickness with which it can be put into service, a feature which may in some instances greatly overweigh even a greater cost of operation than with steam. Such an instance may not infrequently be found in the case of a stand-by plant for the use of a transmission system where the reserve may be called on at very short notice and for such brief periods as make the total fuel cost insignificant. Although internal-combustion engines have not been favorites for electric service in this country, yet a few plants have been successful enough to keep the question alive, and internal-combustion engines in the rôle of auxiliaries have certain advantages that are well worth considering.

Recuperative Power of the Industry

The views of electrical business men which are being published in the *Electrical World* are characteristic of the common sense in the industry. Though humanitarian feelings are outraged, we have to think of business matters and prospects. It is not to be expected that the industry will regard the effects of the war with unbridled enthusiasm. It is to be expected that the best judgment and intelligence will be brought to bear in analysis of commercial causes and effects to the end that all the good possible may be extracted from circumstances. It is not a time when we need to resort to those fate-defying mottoes which are used occasionally to bolster up tired spirits, such as "Be an optimist" or "Wear a smile." It is possible at one and the same time to refrain from being a rampant optimist and to keep far from pessimism. There are many signs of favor for this fair land. A most important influence is our wonderful recuperative power after shock. One of our best traditions is that this country always pulls itself together rapidly and that even a serious setback

only delays a little the time of restored activity. In his diagnosis a physician always allows for the recuperative power of the patient. If we make the same allowance for the wonderful innate forces that have displayed themselves in the past, we shall find good reason for sober, sane hope and confidence. Constructive elements are at work to overcome destruction. This restless, pushing, aggressive population will find a way. The late J. P. Morgan is quoted as having said that the men who bet against the future of the United States would lose. That is still true.

The Production of Powerful Magnetic Fields

In the various branches of scientific research included within the bounteous scope of physics and chemistry the need for powerful and long-sustained experimental magnetic fields becomes more plainly realized. Some of the inquiries which are being conducted into the realm of subatomic structure involve magnetic fields as laboratory implements. Moreover, the investigators declare that they cannot utilize ordinary fields to any advantage. Dynamo engineers have to provide extensive magnetic fields in their machines, with densities of about 10 kilogausses, and these engineers properly consider that a cubic foot of total air-field magnetized to such a density constitutes a creditable magnetic achievement. Occasionally, and for special purposes, a dynamo designer will introduce fields of, say, 20 kilogausses in steel, but the magnetic metals develop so high a reluctivity at such densities that there ceases to be any advantage in securing them on a larger scale. Nevertheless, the physicists and physical chemists refuse to be contented with these magnetic results and calmly ask for densities of 50 and even 100 kilogausses. Under such demands the dynamo engineer has to admit that the article requested is not listed in his catalogs.

The *Revue Générale des Sciences* of July 15 and 30 contains an article by Prof. A. Cotton on the means necessary for producing very powerful magnetic fields in the laboratory. The University of Paris has become interested in an electromagnet of great power and had set aside a noteworthy *ante-bellum* appropriation for experimentation under the auspices of the French Academy of Sciences. The author discusses the types of electromagnet considered most suitable for the purpose and the amount of expense involved. It is, of course, admitted that the very best iron or steel becomes magnetically saturated in the neighborhood of 20 kilogausses, but to the magnetizing flux density there is no known upper limit. That is, iron cores may be used to contribute to the final flux density as far as they will go, but the field will have to depend upon the magnetizing force over and above the saturation limits.

The conclusions reached in the article is that fields of 100 kilogausses can be produced in a volume of, say, half a cubic centimeter if money enough is available. By designing the iron frame of the magnet carefully, making it large enough, and applying ampere-turns enough at the right places the gausses can be produced. A salient difficulty is in the cooling of the winding, because the power absorbed in the magnetizing coil runs to hundreds of kilowatts, and thousands are even considered in some designs. The discharge and removal of this large amount of power becomes a great task, even for water-cooled hollow copper wire. Moreover, it is considered that the energy absorbed and dissipated during several hours of experimentation may be so great, when 100-kilogauss fields have to be sustained, that the apparatus might have to be set up in or near to an electric substation.

It is to be feared that the recent military explosion in Europe will defer these interesting but ambitious magnetic projects. The same collapse for the present attends, alas! innumerable scientific and engineering projects. Tests upon an actually constructed powerful electromagnet, of the Weiss type, made at Paris, showed a field of 50 kilogausses produced between the tips of conical pole pieces, with a consumption of some 200,000 ampere-turns and 25 kw. The magnet is provided with two large cylindrical water-cooled hollow-tube coils.

Inductive Interferences

The report of the joint committee on inductive interference to the Railroad Commission of the State of California, an abstract of which appeared in our issue dated Sept. 5, is a document representing the results of a very large amount of experimental research on the part of the committee and containing very important suggestions for the constructing engineer. The committee itself consisted of experts representing electric railroad, telephone, telegraph and transmission interests, besides the railroad commission itself. Its particular office was to investigate the inductive disturbance from parallelism between the various circuits considered and to recommend to the railroad commission a suitable scheme for minimizing the difficulties which were found to exist. Inductive disturbances between transmission and telephone lines are, of course, entirely commonplace, and since the very beginning of three-phase transmission in this country it has been customary to transpose the lines in order to equalize as far as possible induction on neighboring circuits. Unfortunately, quantitative experiments on induction under the conditions found in actual practice are extremely difficult to make, and very little has been accomplished in this important direction. It is to be hoped that the California committee will continue its investigations to an extent that will enable constructors to avoid the difficulties with the minimum possible trouble.

The main facts brought out by the investigation carried on by the joint committee, to a certain extent already familiar to engineers, are very clearly set forth in the report. The two fundamental facts regarding interference with communication circuits, whether telephonic or telegraphic, are, first, that the trouble is due to the residual, unbalanced components in the transmission circuit, and, second, that it is due chiefly,

and in most cases wholly, to the harmonics of the fundamental frequency. At sixty cycles per second the fundamental is of too low pitch either to affect very strongly the telephone receivers or to interfere very much with conversation, when it becomes evident at all. Anyone listening over a circuit on which inductive interference of a sixty-cycle current exists will at once realize that the pitch of the note heard is far higher than that corresponding to the fundamental, which indeed is often difficult to hear at all, and that the hum as heard is not a pure tone of any kind, evidently containing harmonics of pitch far above the fundamental. As is well known to engineers, the harmonics in an alternating-current circuit are of odd order, the third, fifth, seventh and so on, the even harmonics being for practical purposes suppressed. The experiments of the committee show that on actual transmission systems harmonics up to the thirty-fifth are observable; those from the third to the eleventh are generally the ones of conspicuous magnitude, particularly the third.

The ordinary telephonic frequencies indicate that harmonics from the fifth up, say, to the fifteenth are those most likely to be troublesome. With a properly transposed system the total effect of a balanced three-phase circuit should be very trifling, but any lack of balance leaves a residual component which, in virtue of its harmonics, may cause serious trouble. Protection, therefore, should be based on reducing the residual effects to the lowest possible point and minimizing the harmonics by carefully spiraling the lines and using apparatus giving as pure a fundamental wave and as trivial harmonics as possible. The latter precaution is desirable for many reasons, since a high harmonic of considerable magnitude is very likely to produce unpleasant resonant effects. It would be rather interesting to know in this connection whether the circuit on which the committee found a twenty-third harmonic of 1380 cycles per second was particularly liable to what is euphemistically called "static." By inference the proposed rules, which may call for transposition at as short intervals as one-sixth of a mile in extreme cases, indicate that a good deal more care should be exercised in transposition than has sometimes been the case.

Many of the early three-phase lines were spiraled with a comparatively sharp twist. In later systems use has sometimes been made of much longer spirals. It looks very much as if the committee had found the earlier plan to be the better. It certainly is more likely to give uniform lengths of inducing wire symmetrically related to the parallel circuit. Communication circuits properly transposed tend further to decrease the trouble. It is quite apparent from the report that a large part of the inductive trouble arises not from inefficient transposition but from other causes, such as badly unbalanced loads, grounds, unbalanced star connections, and in general from operative conditions which disturb the symmetry of the inducing system. Here again the requirements which prevent inductive disturbances are also conducive to more accurate regulation and involve less likelihood of difficulties associated with resonance and surging. In other words, the more accurately symmetrical throughout the three-phase circuit can be made the better on the whole will be its own service from every point of view and the less trouble will be found from induction. In view of common transmission practice some of the requirements seem somewhat burdensome. In particular, switching requirements and other provisions against transitory unbalancing are needlessly severe and if carried out will work hardship. It should be quite enough if the regular running conditions are so established as to give a minimum of inductance. The work of the committee has been excellent in its thoroughness as far as it has gone, and the program laid out for the future gives good hope of clearing up once and for all the troublesome problems now under discussion.

Artificial Illumination and Vision

Prof. F. K. Richtmyer's speculations regarding the effect of artificial illumination on vision, appearing in this issue, will help again to call attention to that most puzzling of phenomena, the apparent difference between natural and artificial lighting in its effect on the eye. He argues that some of the trouble may be attributed to an unwonted state of adaptation of the eye, which in artificial light is neither fully light-adapted nor fully dark-adapted. His special hypothesis connecting this with the migration of pigment is hardly in accordance with views of most physiologists, since the pigment is by many believed to be connected in some way with the sensitization of the rods and cones, and it is a fact that the sensibility to light energy of the dark-adapted eye is hundreds of times greater than in the case of the light-adapted eye. This aside, however, the hypothesis of the existence in artificial light of a condition of adaptation which is abnormal is worth considering as one portion at least of the complex cause which may act to produce trouble under artificial light.

The author points out that primeval man was exposed to many hours of night with dark adaptation and many hours of daylight with light adaptation, the intervening periods being relatively short. However. we have sometimes asked ourselves a question which may be worth considering. Is it not possible that a large factor in the eye strain alleged to be due to artificial illumination may be chargeable to the mere fact that the modern eye instead of being used moderately for twelve hours a day is worked intensively eighteen hours? There were few reports of trouble from artificial illumination up to the very recent time in which night has been to no inconsiderable extent turned into day, despite the fact that early artificial illumination was generally bad, insufficient in quantity and improper in direction. Five or six hours of artificial lighting superimposed on an eye which has already done its day's work may reasonably be expected to be not without fatiguing effects. At all events, studies like the one before us are of interest in serving to direct attention to a rather puzzling condition of affairs in a way to help alleviate the troublesome condition.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

Objects of the Supply Jobbers' Association

The objects of the Electrical Supply Jobbers' Association as a body were explained in detail for the benefit of manufacturers and jobbers by Judge T. M. Debevoise, counsel of the association, at the regular quarterly meeting of that body held in the Clifton Hotel, Niagara Falls, Canada, on Wednesday, Thursday and Friday of this week. Owing to misconceptions, occasioned perhaps by meetings behind closed doors, as to the exact functions of the jobbers' association, manufacturers were invited to the session on Wednesday afternoon for the express purpose of acquainting them with the aims and purposes of the association.

As outlined by Judge Debevoise, the sole purpose of the Electrical Supply Jobbers' Association is the education of its members in economical handling and distribution of electrical merchandise and the interchange of experiences bearing on jobbing problems. If the jobber cannot offer the manufacturer a cheaper means of distributing his wares than by selling them directly, he cannot justify his existence, and the jobbers' association is useless. The association welcomes to its ranks all jobbers. It does not encourage, nor does it want, electrical contractors as members, because the electrical contractor is the legitimate customer of the jobber. The association publishes a catalog of electrical merchandise which is open to every manufacturer of electrical supplies, provided he bears the expense of printing and inserting his sheets in the catalog. This work is done at actual cost.

No inquiries are made as to the methods used by the manufacturer in marketing his product or the profits possible for jobbers. The association as a body does not restrict its members in their dealings with manufacturers nor does it attempt to influence manufacturers in their dealings with jobbers not members.

It was pointed out that a manufacturer in marketing his goods has two ways open to him. One is to sell through the jobber and the other is to sell directly to the ultimate consumer. The members of the Electrical Supply Jobbers' Association are scattered all over the country, and it is but natural for a manufacturer, if he chooses to sell through the jobbing trade, to select, among others, members of the Electrical Supply Jobbers' Association. It was admitted that there are good jobbers who are not members of the organization. In his dealings with the jobbers, however, the manufacturer is not dealing with the jobbers' association, as that body has no dealings with manufacturers. The trouble is that because a manufacturer is unable to sell his goods to a jobber he accuses the jobbers' association of conspiracy in restraint of trade, whereas the association as such has had nothing whatsoever to do with the matter. Its members are free to purchase when and where they please. Prices are never discussed in the meetings nor is any attempt made to influence purchases.

Routine matters were taken up at the other sessions, held on Wednesday and Thursday and on Friday morning, when the meeting adjourned. The next meeting of the association will be held at Birmingham, Ala., in November or December, 1914.

Funds for Los Angeles Power Bureau

As the Los Angeles Aqueduct Power Bureau is in need of funds with which to continue its appraisements and preliminary construction work, it has been proposed that $3,500 per month be appropriated from the general fund until power bonds can be sold to carry on the hydroelectric development project. It has also been recommended that $50,000 additional be provided, at the rate of $6,000 per month, to permit the construction of tunnels in San Francisquito County. The tunnels are necessary to insure a sufficient supply of water for the expected needs of the summer of 1915. The City Council has not definitely promised to provide the money, but has adopted resolutions which indicate that some way will be found to raise the money. The subject has been referred to the finance committee.

Boston Street-Lighting Order Vetoed

Mayor Curley of Boston has vetoed an order of the City Council serving notice upon the Edison Electric Illuminating Company of the termination of the existing street-lighting contract. The Mayor calls attention to the fact that the approval of the order would make necessary the payment of $103.54 per lamp for the next year, and intimates that under the existing contract it was the duty of the former Mayor, in the twelve months prior to April, 1913, to request the Gas and Electric Light Commission to fix a lower price if the city was dissatisfied with the present terms. The Mayor lately made a courageous stand on behalf of a new contract proposed by the company under the terms of which the city would save materially over the present cost of street illumination. The Council refused to accept the contract, largely through the political influence of the labor organizations of the city. The Mayor purposes to discuss the question with the board and then to have a conference with the company before taking action.

Empire State Association on Municipal Competition

The Empire State Gas and Electric Association, through Mr. James T. Hutchings, the president, and Mr. C. H. B. Chapin, the secretary, has submitted to the New York Public Service Commission, Second District, a discussion of questions arising from the application of the village of Bath for a certificate of authority to construct an electrical plant. The association quotes from decisions of leading commissions on the subject of competition against existing plants. It states that while there is practically unanimity among regulating bodies in the acceptance of the theory of regulation in place of competition, there are some differences as to the extent to which the theory should be applied. It mentions the acknowledged fact that duplication of investment is an economic waste injurious in the long run to the public which it is one of the duties of commissions to protect. It holds that a commission as well as a company is responsible for the adequacy of the service in any community and the reasonableness of the rates charged, and

that the commission may not shirk this obligation on account of the difficulties of the situation. While steps are being taken in all parts of the country to conserve natural resources, often at great expense, it appears illogical and prejudicial to the public welfare to compel or even permit the waste of artificial resources already created. The association believes that it is the duty of the commission to utilize every means at its disposal to prevent the economic waste consequent upon duplication of investment and facilities in the public service.

A hearing in the case was held by Commissioner Emmet of the commission at Albany on Sept. 9. Members of the executive committee of the Empire State, Gas and Electric Association appeared.

Cleveland I. E. S. Convention Program

On page 367 of the issue of the *Electrical World* dated Aug. 22 and on page 456 of the issue for Sept. 5 appeared lists of the papers to be presented at the eighth annual convention of the Illuminating Engineering Society to be held at the Hollenden Hotel, Cleveland, Ohio, from Sept. 21 to 26, 1914.

On Monday, Sept. 21, at 10:30 a. m., will be held the opening business session, during which Mr. C. O. Bond will deliver the presidential address. In the afternoon, beginning at 2 o'clock, the first technical session will be held. Additional technical sessions are scheduled for Tuesday morning, Thursday morning and Thursday evening. There will be a lecture session on Tuesday evening, commercial sessions on Wednesday morning and Wednesday afternoon, and laboratory sessions on Wednesday morning and Wednesday afternoon. Thus during both the morning and the afternoon of Wednesday commercial and laboratory sessions will be conducted simultaneously.

The entertainment features include a formal reception and ball at the Hollenden Hotel Monday evening, a popular lecture at the Chamber of Commerce Building Tuesday evening, a banquet at the Hollenden Hotel Wednesday evening, and a trip to Nela Park Thursday afternoon and evening. Additional entertainment features arranged for the ladies attending the convention include afternoon tea at the Hollenden Hotel on Monday, a trip to women's clothing factories Tuesday afternoon, and luncheon and bridge at a country club Wednesday afternoon.

Vermont Electrical Association

The annual meeting of the Vermont Electrical Association will be held on Sept. 18 and 19, 1914, at Brattleboro, Vt. On the evening of the first day there will be an informal reception at the Brooks House, with a banquet at 7.30 o'clock, to be followed by brief addresses by the president of the association, Mr. Walter H. Vorce, St. Albans, and the president of the local board of trade. At 9.30 p. m. the two-reel motion picture, "Selling Electric Vehicles," of the Electric Vehicle Association of America will be shown at Island Park Pavilion, after which a dance will be held. On Sept. 18 there will be a business meeting at 9 a. m., at which a paper will be read by Mr. C. W. Betcher, General Electric Company, Harrison, N. J., on the nitrogen-filled tungsten lamp. At 11 o'clock the party will leave the Brooks House in automobiles furnished through the courtesy of the Brattleboro Board of Trade and will visit the Vernon hydroelectric station of the Connecticut River Power Company, an 18,000-kw plant supplying energy for the territory between Keene, N. H., and Providence, R. I., and interconnected with the Deerfield Valley system of the New England Power Company. The convention will close with a clambake at Spofford Lake. Mr. A. B. Marsden, Manchester, Vt., is secretary and treasurer.

Indiana Electric Light Association Convention

At the annual convention of the Indiana Electric Light Association, to be held at the Hotel Severin, Indianapolis, Sept. 23 and 24, the following papers and addresses will be presented: Address of the president, Mr. Thomas F. English, Muncie; accounting session in charge of Mr. Fred L. Dennis, South Bend; "Valuation for Rate-Making Purposes," by the Hon. Halford Ericson, Madison, Wis.; address by Judge Thomas C. Duncan, chairman of the Indiana Public Service Commission; "Commercial High-Tension Outdoor Substations," by Mr. H. W. Young, Delta-Star Electric Company; "Profitable Methods of Obtaining Old-House Lighting Business," by Mr. A. T. Holbrook, Excess Indicator Company; "Street-Lighting Fixtures and Regulating Equipment for Nitrogen-Filled Tungsten Lamps," by Mr. W. P. Hurley, Westinghouse Electric & Manufacturing Company; "Lightning Protection," by Mr. V. E. Goodwin, General Electric Company; "Public Policy of Utilities," by Mr. G. E. Gaskill, Greenville, Ohio; "The Newer Tungsten Lamps and Their Applications," by Mr. J. R. Colville, National Lamp Works of the General Electric Company.

The annual banquet and dance of the association will be held on the evening of Sept. 24. Mr. Thomas Donohue, Lafayette, is secretary of the association.

Association of Iron and Steel Electrical Engineers

At the eighth annual meeting of the Association of Iron & Steel Electrical Engineers, to be held at the Hotel Statler, Cleveland, Ohio, from Sept. 14 to 19, the following papers are scheduled for presentation: "Underground Transmission in a Steel Plant," by Mr. F. D. Egan; "Underground Cables and Accessories," by Mr. J. C. Bowman; "Application of Auxiliary Apparatus in Iron and Steel Mills," by Mr. Stewart C. Coey; "Magnetic Control Characteristics," by Mr. H. F. Stratton; "Alternating-Current and Direct-Current Magnetic Control for Auxiliary Motors," by Mr. W. O. Lum; "Some Electrical Problems Practically Considered," by Mr. B. G. Lamme; "The Control of Induction Motors for Rolling Mill Drive," by Messrs. Wilfred Sykes and G. E. Stoltz; "Transformer Construction for Steel Mills," by Mr. G. A. Waters; "The Apprenticeship System as Applied to Steel Mills," by Mr. B. W. Gilson; "A Synchronous Condenser Installation for Power-Factor Correction and Voltage Regulation," by Mr. W. O. Oschmann; "Watt-hour and Ampere-hour Meters and Their Applications in Steel Mills," by Mr. R. C. Lanphier; "Switchboard and Switching for Steel Mills," by Mr. Saul Lavine; "Organized Safety," by Mr. L. R. Palmer; "Statistical Data of Electrical Application in the Iron and Steel Industry in the United States," by Mr. R. Tschentscher; "Condensers and Their Auxiliaries," by Mr. R. N. Ehrnhart; "Silent-Chain Power Transmission," by Mr. F. L. Morse, and "The Flaming-Arc Lamp in the Iron and Steel Industry," by Mr. Allen T. Baldwin.

On Wednesday, Sept. 16, at the afternoon session, there will be a discussion of the suggested co-operation between the American Institute of Electrical Engineers and the Association of Iron and Steel Electrical Engineers, with a view of possible amalgamation.

Convention of New England Section, N. E. L. A.

The sixth annual convention of the New England Section of the National Electric Light Association was held at the New Mathewson Hotel, Narragansett Pier, R. I., on Sept. 2-4, with a total registration of 400. The meeting opened on the evening of Sept. 2 with an informal reception by the officers of the section, followed by a smoker in the music room of the hotel and dancing at the Casino. The entertainment program included sea bathing, automobile trips for the ladies, golf and tennis at the Point Judith Country Club. A polo match was held at the club on the afternoon of Sept. 4, and the convention closed with a banquet at the New Mathewson on Friday evening.

At the opening session President C. C. Wells introduced Lieut.-Gov. Roswell B. Burchard of Rhode Island, who welcomed the convention in a speech which included an eloquent tribute to the aims and accomplishments of the electrical profession. The report of the treasurer, Mr. R. W. Rollins, showed a cash balance of $337.08, and the report of the secretary, Miss O. A. Bursiel, showed that there are now 897 members in the New England Section, eighty-six of whom have been added since Jan. 1. A plan was announced by which the secretary will be available during the coming winter for lectures before women's clubs and other organizations of this kind in the interest of a wider knowledge of the possibilities of electricity in the home. The president's address emphasized the value of association membership to the small company.

Old-House Wiring and Special Campaigns

Mr. E. C. Kimball, of the Boston Edison company, presented the paper on old-house wiring and special wiring campaigns, of which an abstract was printed in last week's issue of the *Electrical World*.

In the discussion on this paper Mr. C. H. Stevens, Lynn, Mass., emphasized the value of a definite proposal to the prospective customer for house wiring, stating the exact cost at the first interview and offering the benefits of the instalment plan of payment. Mr. J. E. Spike, Cambridge, Mass., said that one salesman now devotes his entire time to house wiring. The company's relations with the contractors are good and the latter have done much to convince prospective customers of the desirability of increasing their installations. In five months a local campaign resulted in ninety-five contracts totaling $6,070. The company's proposition is the installation of a three-lamp parlor chandelier or cluster, a two-lamp shower fixture for the dining-room, a cellar outlet with switch control, and four other outlets as desired by the customer, for $47.50. The company retains $5 of this for advertising purposes and the contractor gets the rest. By giving tungsten lamps and pull-chain sockets the company has comparatively little difficulty in meeting competition in the form of lower prices by contractors who submit special bids on their own account. For every contract secured by a contractor which totals more than $47.50 the company allows the contractor an extra $3.25. The company's connected load in appliances increased from 169.5 kw to 351 kw in the past year.

Mr. Edward Mandeville, Worcester, Mass., pointed out that in three years his company had displaced 2000 gas "arc lamps" by its policy of loaning fixtures. Gas piping is being omitted in many new stores, and on Sept. 1 the company started a campaign for wiring small fruit stores, groceries, candy establishments, etc., which often have a transient career and the proprietors of which are therefore little disposed to invest in wiring. Such stores are wired free by contractors compensated by the company on the basis of a rental charge of 10 cents per lamp per month, the contract being for two years. If the customer moves meanwhile, the installation becomes a part of the store structure. Sketches of such stores, with outlet locations, are posted regularly at the company's office, and the lowest bidder gets the contract. The address of the establishment is not given until the contract is awarded. Mr. R. M. Buttner, Worcester, pointed out that many houses are being wired at present by journeymen on day work. When local contractors figure on the house-wiring installations they receive twenty-four hours to prepare their bids, and the successful bidder holds a conference with the company and checks the local conditions before beginning work. Of 500 old houses wired, the connected load secured was 7626 50-watt equivalents, yielding an income of $7,500 per year.

Mr. W. K. Bradbury, Franklin, Mass., spoke of securing twenty contracts per month for house wiring during the past two years and outlined the campaign of his company. A valuable feature of such work is the installation of a service plug outlet which can be used without unscrewing the lamps. Mr. H. J. Pettengill, Jr., Woonsocket, R. I., said that although 75 per cent of the residences are close to the mains, only 15 per cent of these are using electric service, or 11¼ per cent of all in the community. Mr. Hibner said that a house-wiring survey in Portland, Maine, showed that in 9000 houses 5000 were using either gas or oil. An electric-sign campaign giving the consumer three years in which to pay for the installation is about to be started. Mr. B. H. Gardner, Waterbury, Conn., questioned the wisdom of lending store fixtures. He said that only 0.5 per cent of the instalment payments on house-wiring installations were allowed to lapse. Mr. Schwabe cited the success of a plan by which the tenant pays 50 cents more rent per month, the landlord contracting for the wiring of the installation on the basis of paying the company 10 per cent cash and the balance in twelve monthly payments. Mr. G. H. Allen, Hartford, Conn., said that local contractors will now wire an old residence of almost any kind at from $2.25 to $3.25 per outlet. For six years the company has loaned fixtures for commercial service, but it has now set 100 watts per lamp as the minimum of such installations and tries whenever possible to standardize on 250-watt lamps.

Relation of Meter Maintenance to Revenue

The importance of accurate meter service was emphasized in a paper by Mr. G. F. Atwater, United Electric Light & Water Company, New Britain, Conn. The author touched upon the influence upon meter accuracy of friction, change of power-factor, alterations in frequency, overloads, light loads and short-circuits, and pointed out that a much larger percentage of meters in service are affected by conditions tending to make them run slow than by those tending to speed them up above normal. To obtain the average percentage of accuracy of a meter operating under variable load, the author gave the following rule:

Multiply the result of the test at normal load by three and add to this the result of the test at one-tenth capacity and full capacity of the meter, and divide the result by five. The quotient will be the average percentage of accuracy. The normal load is generally taken for residences as 25 per cent of the total installation and for general store lighting as 60 per cent. The average percentage of accuracy varies with time. For lighting loads the author recommended the installation of meters which are nearly fully loaded when operating normally. Meters are now built which will stand from 200 to 300 per cent overload for a limited time. The cost of meter testing and adjustment will generally be more than overcome by the saving in revenue resulting from increased accuracy of registration. The

maintenance of accuracy in station voltmeters is an important matter and costs comparatively little in proportion to the benefits. A station voltmeter reading 1 per cent high and not detected, thereby causing the voltage at the center of distribution to fall 1 per cent under the rated voltage of the lamps, means that the central station loses 1.5 per cent in revenue and the customers 3.5 per cent of the light to which they are entitled. Meter departments should be composed of careful, experienced men, the policy of organizing such an important division by putting meter readers of limited experience upon it being anything but desirable.

Discussion

Mr. C. T. Taylor, of the Edison Electric Illuminating Company of Boston, advised testing each new meter, paying special attention to gears and mechanical details liable to derangement during transportation. Direct-current meters, which are subject to the influence of external magnetic fields, should receive a special accuracy test two or three weeks after installation. Meters of the large-capacity, single-phase type should be tested yearly, and the meters in large department stores quarterly. Suburban companies cannot be expected to test meters as often as city central stations. Mr. C. A. Dean, Cambridge, Mass., said that 70 per cent of his customers are equipped with 5-amp meters. He discountenanced returning actual money to customers in case of inaccuracies on account of the adverse impression thus given as to the meter. Mr. H. W. Brown, General Electric Company, said that the making of tests of meters on light, normal and heavy loads to obtain average accuracy figures represents largely a waste of time. Mr. F. B. Hall, Providence, R. I., pointed out the deleterious effects of short-circuits on meter accuracy and advised looking out for wall vibration as a means of impairment. The Providence company tests large department-store meters every two weeks. Usually the company's meters are tested at 10 per cent and 100 per cent load, the average cost being 40 cents per direct-current meter and 35 cents per alternating-current meter. Of 10,000 meters tested, the company found an accuracy of 99.5 per cent, the loss in revenue corresponding to $2,500 per year. Mr. F. W. Prince, Hartford, Conn., said that his company tests 10,000 induction meters once in two years, 2000 commutator-type meters once in nine months, and the largest meters once in every two weeks.

Abstracts of other papers and discussions will appear in a later issue.

The Banquet

At the banquet the program included an address by Mr. L. D. Gibbs, president-elect of the New England Section, upon the modern newspaper, and one by Mr. T. C. Martin, New York, executive secretary of the N. E. L. A. The former speaker discussed the problems of the present-day press, showing a keen appreciation of their difficulties and the limitations of the modern daily, with the object of giving his hearers a better understanding of the work of these molders of public opinion. Mr. Martin spoke of the work of the national organization, touching upon the "Salesman's Handbook" and the "Handbook on Overhead Line Construction," which have been issued at an expense of $12,000. He spoke in an optimistic vein regarding the future of the central-station industry, saying that its high diversity-factor appears to safeguard it against the more serious results of the present European war. With reference to the electrical industry as a whole, Mr. Martin said that of $250,000,000 a year produced in electrical goods not over 10 per cent goes abroad. The opportunities for developing export trade are very large and, if seized, are likely to lead to an increase in production which will ultimately result in lower supply and equipment costs for American central stations.

Officers

The following officers were elected for the ensuing year: President, Mr. L. D. Gibbs, Boston, Mass.; vice-president, Mr. W. S. Wyman, Augusta, Maine; treasurer, Mr. R. W. Rollins, Worcester, Mass.; secretary, Miss O. A. Bursiel, Boston, Mass.; executive committee, Messrs. C. A. Mixer, Maine; R. D. Smith, New Hampshire; E. P. Powell, Massachusetts; E. A. Barrows, Rhode Island, and B. H. Gardner, Connecticut.

The President-Elect

Mr. L. D. Gibbs as superintendent of advertising of the Boston Edison Company has developed in a masterly fashion what might be called the psychological side of central-station practice. He is an original worker of great personal magnetism and has made a success of numerous projects relating to the application of high-grade publicity. Mr. Gibbs was born in St. John's, Mich. After receiving a high-school education and working in Denver, Col., he returned to St. John's and for three years was occupied in printing and country

PRESIDENT-ELECT L. D. GIBBS

newspaper work. He then entered Oberlin College and was graduated in 1898 while on the staff of the Springfield (Mass.) *Republican*. He went to Washington as private secretary to Congressman F. H. Gillett, of the Second Massachusetts District, also serving as Washington correspondent of the Springfield *Republican* and later as assistant in the same work for the Boston *Transcript*. In the presidential campaign of 1904 he was in charge of Republican publicity in suburban dailies and weeklies. Mr. Gibbs joined the staff of the Edison Electric Illuminating Company of Boston in 1906 and was made superintendent of advertising in 1910.

Mr. Gibbs is third vice-president of the National Electric Light Association, has served on the membership committee and was vice-chairman of the committee on merchandising and advertising of the Commercial Section last year. He has been secretary of the New England Section of the Illuminating Engineering Society and of the Electric Vehicle Club of Boston, and is an associate member of the American Institute of Electrical Engineers and a member of the Engineers' Club of Boston and other organizations. His home is at Newton, Mass.

Colorado Electric Association at Glenwood Springs

The twelfth annual convention of the Colorado Electric Light, Power and Railway Association was held at Glenwood Springs, Col., on Sept. 3, 4 and 5.

The entertainment features included an automobile ride for the ladies on Thursday afternoon, with dancing in the evening in the ballroom of the Hotel Colorado. The large outdoor swimming pool, which receives its supply of water from the hot mineral springs, furnished amusement on Friday. Later a beefsteak fry was held at the picnic grove, followed by dancing. On Saturday among the contests held were races by the ladies on land and in the water, followed by a baseball game between the central-station men and the manufacturers and by dancing later in the evening.

The meeting was called to order on Thursday by the president, Mr. W. C. Sterne, vice-president and general manager of the Summit County Power Company. Mr. Thomas F. Kennedy of Denver, secretary of the association, was absent, and Mr. F. P. Safford acted in his stead. Mayor Charles D. Barnes of Glenwood Springs delivered an address of welcome, using a number of electrical terms in a humorous manner that delighted the convention, and ended by delivering up the "keys" to the circuits of the city.

In a paper on "The Relation Between Incandescent Lamp Voltage and Resulting Revenue and Service" Mr. R. Arnold Lewis showed that the use of proper lamps and voltage results in building a good load and in improving the lighting service and also the revenue.

Lamp Ratings and Renewals

Mr. J. F. Dostal, general manager of the Colorado Springs, Light, Heat & Power Company, stated that tungsten lamps are so popular that he cannot give away the carbon-filament type. Mr. H. S. Russell, of the Denver Gas & Electric Light Company, said that his company uses lamps the ratings of which are equal to the voltage of the circuits on which they are used. He added that the lamps did not hold up to their rated life on over-voltages, and hence the company could not afford to operate at increased voltages because complaints cost it more than would be obtained from increased revenue. Mr. L. P. Hammond, of the Colorado Power Company, stated that his company allows its customers a small amount toward the renewal of tungsten lamps. To reduce the renewals the company operates at a pressure below the rated voltage of the lamp.

Flat Rate Versus Meter Charge

Mr. Hammond expressed himself as being in favor of a flat rate when serving customers who use only two or three lamps, the wiring in such cases being connected from house to house and the fuses installed outdoors. This arrangement makes it unnecessary to require a meter deposit and makes it more convenient to connect additional consumers without considerable expense. He added that he preferred the over-hour use of lamps to investments in and repairs on meters, because the only additional expense with long-hour use is for a little more water to drive the hydroelectric equipment or for more fuel where a steam plant is used. Mr. Dostal stated that there was more excuse for flat rates ten years ago when meters cost $15 than there is at present with the cost of meters at $6. His experience has been that the three-lamp customers use heating appliances in the daytime, therefore he prefers the use of meters with a minimum monthly charge of $1.50. Mr. Dostal declared that sockets can now be obtained which will not allow the removal of lamps before they are burned out, thereby preventing the use of heating appliances on sockets not intended for that purpose.

Mr. W. F. Raber, manager of the Arkansas Valley Railway, Light, Heat & Power Company, Pueblo, Col., stated that many customers can be obtained on the flat-rate basis who cannot be secured when billed on actual energy consumption. He added that overtime use of electricity on the flat-rate system can be prevented by installing time switches.

During the discussion on "question box" topics Mr. H. U. Wallace stated that his company employs steel-wire transmission lines with 350-ft. spans for supplying energy to irrigation pumping installations. Using 35-ft. poles and No. 4 wire, the steel-circuit lines cost only $425 per mile, or only one-half what copper lines do.

Flame-Arc and Nitrogen-Filled Lamps

Mr. B. H. Durbin, of the Bryan-Marsh Works of the General Electric Company, discussed the characteristics of 1000-watt nitrogen-filled lamps. He pointed out that one 1000-watt lamp will bring in revenue about equal to that obtained from three residences supplied with electric service. These high-rated lamps are especially adapted to color matching and photographing, as the illumination produced by them approaches that of daylight.

PRESIDENT-ELECT W. F. RABER

Mr. L. C. S. Wood, of the Westinghouse Electric & Manufacturing Company, presented the advantages of flame-arc lamps. He called attention to the fact that this type of illuminant has been developed as much as high-rated tungsten lamps, adding that a maximum of 2000 cp is developed with a consumption of only 445 watts. The cost of energy for flame-arc lamps and the expense of maintaining them is relatively low compared with the corresponding expenses required for nitrogen-filled lamps. Flame-arc lamps are especially adapted to the lighting of railway yards, docks and factories.

Abstracts of other papers and discussions will appear in a later issue.

Committee Reports and Election of Officers

Saturday morning was devoted to the reports of committees and to the election of officers. Mr. W. F. Raber, Pueblo, Col., was elected president, and Mr. John J. Cooper, Central City, Col., was made vice-president. The president-elect has been vice-president and general manager of the Arkansas Valley Railway, Light & Power Company, Pueblo, Col., since June, 1911. Prior to that time he was general manager of the Mansfield (Ohio) Electric Railway, Light & Power Company for three years.

Prospects for Domestic and Foreign Business

Analyses of the Situation by Keen Observers Show Many Elements of Encouragement for the Industry

VIEWS OF MR. GANO DUNN ON BUSINESS

Economic Effects of Destruction of Capital Offset to Some Extent by Greatly Increased Exports

Mr. Gano Dunn, president of the J. G. White Engineering Corporation, who was in Europe at the time war was declared, has given, at the request of the *Electrical World*, a statement of his views in regard to the effect of the conflict upon business conditions in this country. It is as follows:

"First—An enormous amount of the world's capital has already been destroyed and more will be destroyed, consequently construction enterprises and new projects of all kinds which flourish on surplus capital seeking investment will be severely checked for a long time.

"Second—Further destruction of capital due to the continuation of the war will probably be greater if the allies are defeated than if Germany is defeated, since the capital of Great Britain, France, Belgium and Russia is much greater than that of Germany and Austria, and it is probable that the former nations would go far toward exhausting their greater joint resources before accepting defeat. The financial and industrial effects of the war, therefore, are involved to a considerable extent in the result of the fighting.

Capital for Small Home Enterprises

"Third—There will probably be greatly increased exports from the United States of foodstuffs and manufactures which will mitigate and to some extent offset the tremendous capital losses in the United States resulting from the destruction of security values and the contraction of credits. There will probably be a general increase in interest rates and also probably a certain amount of American capital available for smaller construction enterprises that are near enough home to be locally known and bring out the resources of the very small investor.

"Fourth—South America will suffer not only through lack of European capital, which has been the principal source of supply for the development of her new enterprises and the extension of her commerce, but also severely through reduced capacity of Europe to take and pay for South American exports. American and Canadian markets will inevitably be benefited by the demand for such South American imports as Europe cannot supply. While these South American purchases will be of much benefit on account of the business they represent, they will be of more value because of the new channels of trade they will open up and the new connections they will establish. Their immediate value should not be overestimated, however, in view of the reduced buying power South American countries will experience from the reduction of their usual exports to Europe.

"Fifth—Any forecast at this time can be presented only as an offhand opinion, since the consequences of the great struggle will so fundamentally affect American international commerce, finance and industry that no one can see clearly the adjustments that must follow."

High Cost of Exchange and Coal

Mr. Dunn has spent much time abroad in the study of business and engineering conditions. When Austria declared war on Servia he endeavored to reach home, but on account of the interruption of railroad communication he was unable to get to Paris and returned to Italy, going to Florence and then to Genoa. Owing to the suspension of payments on letters of credit, Mr. Dunn in common with other Americans experienced many discomforts. By going early in the morning before office hours to one of the banks and awaiting opening, before the full force of the financial disturbance was appreciated, he was able to get a little gold on his letter of credit by paying a premium of 15 per cent. Later he had to pay as high as 40 per cent premium to secure cash on travelers' checks. With several other prominent Americans, Mr. Dunn was able to be of service to American refugees, of whom there were a large number stranded without funds and suffering in Italy. Dock Commissioner R. A. C. Smith of New York, President Nicholas Murray Butler of Columbia University, Mr. Frederick W. Vanderbilt and Mr. Dunn constituted a committee of guarantors which enabled the chartering by Consul-General Jones in Genoa and the subsequent sailing in the face of many difficulties of the steamship *Principe di Udine*, of the Lloyd Sabaudo Line, which was the first refugee ship to get out of Italy. A sudden rise in the price of coal to nearly $20 a ton, and increased costs and complications of all kinds, made the voyage of the ship cost $115,000 in gold, which was between $30,000 and $40,000 more than was collected from the passengers.

DR. WHEELER ON EFFECT OF THE WAR

Believes that Depression Will Be Largely, Though Not Fully, Offset by Gains

Dr. Schuyler S. Wheeler, past-president of the American Institute of Electrical Engineers and president of the Crocker-Wheeler Company, Ampere, N. J., was asked to give his opinion to the *Electrical World* on the probable results of the European war upon the electrical industry of this country.

Dr. Wheeler, in complying with this request, expressed his conclusions as follows: "It is my opinion that the cessation of imports which has been brought about by the war will have no important bad effects upon our industry, because, unlike most others, it uses exceedingly little foreign material. I believe, further, that all industries, even those that have used much imported material, can adjust themselves to the use of domestic material without serious consequences, except possibly in a few cases. Aside from the reduction of business in this country due to the cessation of exports, I believe that a good deal of the dullness about which there is so much discussion is due to anticipated slight increases in the cost of the finished product, but this increased cost will be disregarded when the available supply is used up and need increases the pressure. There will be a considerable dullness of business for a time owing to the natural conservatism of all owners of industries, which holds them back until they have ascertained the exact status of their product under the new conditions in which cost changes, even though very slight, are for the moment considered important. The depression and loss due to the war will, of course, be largely, though I believe not fully, offset by the gains in business that will come to us. In the long run the cost of war falls to some extent upon everybody."

MANUFACTURERS ON BUSINESS OUTLOOK

Many Different Points of View Show Promise and Reasonable Confidence

The *Electrical World* has asked manufacturers to express their opinions concerning the effect of the war on business. A number of replies have been received and some are published herewith. Others will be published in later issues.

Great Strength of This Country

Mr. James I. Ayer, Simplex Electric Heating Company, Cambridge, Mass.: "We have of imported material used in quantity that is important a full year's supply now on hand. Our exports to England continue but will doubtless stop. Our exports to Europe while of interest are not large. Domestic trade has held well with us to date and is ahead of the corresponding period for 1913. The outlook is difficult because of no previous experience with like conditions. It is obvious that the check to business in many directions already experienced will affect all to some extent. On the other hand, with the passing of the shock of the first experience of this extraordinary war our clearing vision is showing the great strength of this rich country. The solid character of established business, our great crops, our ability to manufacture for all markets, and what is vital, the soundness of our banking conditions (this last shown by our now going to the help of South America with branch banks and exchange of bank credits), all point to satisfactory conditions ahead. We will not have a boom, but there will be no encouragement to 'General Depression.'"

Business Holding Up Remarkably Well

Mr. Charles Blizard, third vice-president of the Electric Storage Battery Company, Philadelphia, Pa.: "The storage-battery industry is not so dependent upon imported raw material as are many other lines of manufacture. We believe that the war will not prevent us from getting such material from abroad as we require in our process. The unsettled condition of domestic markets for raw materials dictates caution in current purchases, but it is our opinion that prices will soon steady themselves. Our business is holding up remarkably well. We have had many inquiries from foreign countries which would probably not have come to us under normal conditions, and we judge from these invitations that the war will enable us to find new customers in new fields. Under existing circumstances we are satisfied with our current business and are optimistic as to the future."

Eventual Increased Export Trade

Mr. G. P. Miller, treasurer Bridgeport Brass Company, Bridgeport, Conn.: "The European war has not as yet had very much effect on our business. Eventually it will probably result in an increased export business, judging from the inquiries which we are now receiving. Fortunately, we are not greatly dependent upon European raw materials, although this has affected some of the concerns from which we buy supplies, particularly the crucible makers. We look for an increased business just as soon as the financial situation is relieved."

Middle West Encouraged

Mr. Claude L. Matthews, of W. N. Matthews & Bro., Inc., St. Louis, Mo.: "We feel optimistic over the situation so far as it relates to the general business outlook immediately before us. The difficulty arising from the obligations of this country held in Europe will be cleared gradually by the banking interests. We do not look for any immediate results in the development of a large volume of South American trade. The export business depends to so great an extent on the result of the war that until peace is declared it will be difficult to get it on a normal basis. South American countries have been financed so largely by Europe that a long time will be required for them to reach a normal condition again. Some immediate demands, however, from South America will have to be supplied by American manufacturers. In the Middle West crops have been so good generally that people are encouraged to expect satisfactory business conditions. The only cloud arises from the cotton situation. On account of the financial situation it is likely that new construction will be largely discontinued for a time. Our business has not fallen off so much as we expected it would. We are undertaking a comprehensive advertising campaign and expect to go ahead with it."

Unusual Demand for Electrical Machinery

Mr. J. F. Hemenway, treasurer Smith & Hemenway Company, New York: "The great European war will undoubtedly make an unusual demand on the manufacturers of electrical machinery and tools in the United States from Central and South America as well as other countries of the world. That such will be the result must be apparent from the fact that the warring nations have been forced to discontinue manufacturing, and even after the close of the war will be badly disorganized for months following. The questions of arrangements for shipping, terms for credit and other details must be settled to the satisfaction of the foreign customers, and doubtless this can be done through the branches of our banks that are now being arranged, notably by the National City Bank of New York City. Ous business will undoubtedly be increased and we are procuring goods with a view to supplying the trade as far as possible and giving prompt delivery. We have not been dependent upon European countries to any extent, and therefore do not need to look for substitutes. The cost of production will undoubtedly be increased owing to the increase in the cost of metals and other materials, and possibly a little later in labor. However, as to that, no one can foresee or foretell to what extent the cost of manufacturing may be increased by the results of the conflict now raging."

ELECTRICAL INDUSTRY IN ENGLAND

Summary from a London Electrical Engineer Shows that Every Effort Is Being Made to Solve Industrial Problems

BY HAYDN HARRISON

It has been said that England is a nation of shopkeepers. This may have been intended to apply to the internal industry of the country, but those who have studied the official returns relating to imports and exports could not fail to realize that it applies very largely to the business of the nation as a whole.

There is no doubt that the electrical appliances manufactured in England are barely sufficient to meet her own requirements, whereas large quantitiees have been exported to meet her foreign trade.

The effect of the war has been to cut off the market from which England obtained the surplus she was unable to produce, and also to isolate for the time being the market where she obtained certain raw materials.

Orders Pouring Into Factories

The result of this has been that orders are pouring into the factories of electrical machinery and appliances, not only for home requirements but also for export, and in very few cases does one hear of shortage of work. It is true that this demand has come

at what appeared to be the end of a boom; therefore the factories are in a good position to meet it, except for certain difficulties which naturally arise in a country which has not only had to take her share in the war but is also so adjacent to the seat of war as to have to make provisions for dealing with the refugees and wounded of the friendly nations who are fighting by her side.

The standard of quality of electrical plant, etc., manufactured in Germany was sufficiently high to warrant considerable business with this country, and as proof that this existed it is only necessary to turn up last month's trading in electrical goods. The United Kingdom exported to Germany less than £13,000 value in electrical appliances and purchased from Germany more than £160,000 value of similar goods. It is obvious, therefore, that as most of these goods were required for home use, though of course some of them were exported, English factories must considerably increase their output to meet the deficiency in supplies hitherto obtained from Germany. Every effort is, therefore, being made by the electrical industry of this country to cope with the situation, both by increasing our own production and by obtaining the assistance of other friendly nations.

As regards increasing our own output, it is true that England is not the seat of war; nevertheless, tens of thousands of Englishmen are already in the fighting line and hundreds of thousands are being mobilized. This means that nearly all our factories and works are short-handed and are finding it difficult to compete with the demand put upon them even in normal times. Added to this difficulty is still another, namely, that many of our factories have relied to an appreciable extent on obtaining certain materials and parts from the Continent, especially Sweden, Belgium, Germany and Austria.

Reliance on Continental Materials

Many of these materials, such as certain qualities of iron, steel, porcelain and glass, though to be obtained in England, have not formed a specialty of production, and therefore cannot for the present be produced in the same quantities or at the same price as it has hitherto been possible to obtain them from the Continent. Some of these materials are so essential to the electrical industry that eventually the production of them must create important industries in this country; for example, the lighting side of the electrical industry relies largely on incandescent lamps, yet as far as the writer is aware there are only two incandescent lamp factories in the country which manufacture their own bulbs. The other factories, which are very numerous, have hitherto relied on supplies from the Continent.

Again, as regards arc lighting, there is only one factory of arc-lamp carbons in England, the hitherto large demand having been obtained from Germany, France or Italy.

No Sign of Check

Many will think that the demand for electrical machinery and appliances would receive a check, but there is no sign of this, nor is there indication that any reduction is likely to occur. Electricity supply undertakings in this country are largely in the hands of municipalities which are receiving every encouragement from the government to carry on progressive policies, in order to employ as much casual labor as possible. Again, the export market to our colonies is demanding deliveries as usual, and fortunately our navy has proved itself equal to keeping the high seas open to commerce not only with the colonies but also with the friendly nations that are not adjacent to the seat of war.

Many of the German houses which had branches in England to facilitate the sale of these goods in this country have already closed their doors; others are being kept open to clear such stocks as they may have had, or, should they have been financed with British capital, to factor such goods as they may be able to procure. But there is naturally a prejudice against such houses, which will last for a long time.

Field for Enterprise

Fortunately, all this means that our own factories which can supply this much increased demand are working night and day, but many others which are short-handed and short of materials cannot hope to do their share. Could there be a better field for enterprise than this country presents at the moment? It cannot be a temporary demand, as it must be many years, even if the day ever does come, before Germany at any rate can regain her position in the commercial world.

There is another side of the question—money. By money is meant credit, at least so far as commerce is concerned. The financial credit of England has been amply proved by the fact that the bank rate even at the present moment, with a moratorium in existence, is as low as 5 per cent, but that does not actually affect the case where wages are under consideration. The result of a moratorium is to upset financial routine, which in an industry employing labor on a large scale has a serious effect. It is, therefore, to be hoped that the banks in this country, to which the government has given every assistance, will do their share in helping the employers to tide over the period of suspense, in which case the trouble due to non-employment, so greatly feared in time of war, will be largely reduced. In fact, it is difficult to conceive such an anomalous position as is otherwise likely to arise, namely, that of factories full of orders turning away hands for financial reasons.

As might be expected with war so suddenly declared, panic took place among the old class of Englishmen, who, taking no notice of the affairs of the world, have been content to live in a little world of their own. Many have prophesied that such sense of security must eventually result in decadence. It is, therefore, quite conceivable that war, terrible as it is, will eventually work for good, though, like most medicines, it is unpleasant to take.

Those who have witnessed the way in which electrical engineers of all classes have volunteered for active service and the enthusiasm with which our men have vacated the laboratory, the workshop and the offices to take their places in the army cannot fail to realize that as an industry we have learned the importance of action, and it is to be trusted that this lesson will result in greater activity, not only now but also when peace has been declared, which all sincerely hope will not be long delayed.

Lost Electrical Opportunities

As regards the future, the electrical industry over here has already begun to realize the value of lost opportunities and to prepare for the great opportunities of the future. It is everywhere realized that patience and reasonable sacrifices for the present are essential, and it is gratifying to note that America will benefit probably more than any other country. German exports to the British Empire to the value of, approximately, £100,000,000 per annum will have to be supplied from elsewhere. The share which England will get should eventually be increased. Nevertheless, every electrical engineer over here would be pleased to see America benefit to a large extent and to feel that, when peace comes, we shall be sharing the electrical industry of the world with those who have always been in the vanguard of this great industry, namely, our American cousins.

PUBLIC SERVICE COMMISSION NEWS

Maryland Commission

The Maryland Public Service Commission, following the advice of Acting Chief Engineer Edwards, has advised the Town Council of Elkton that an electric voltage of 6600 is not dangerous when the wire construction is of good materials, put up with good workmanship, and when adequate attention has been paid to location of other lines and crossings.

California Commission

The Railroad Commission has rendered a decision denying the application of the Pacific Gas & Electric Company for a rehearing in the case brought against it by the town of Antioch.

Wisconsin Commission

The Wisconsin commission has laid down the standards for telephone service in a set of twelve rules just issued. Sixty days is prescribed as sufficient time in which to comply with the new rules. Some of the rules are mentioned below:

Equipment and lines shall be so constructed and maintained as to eliminate all cross-talk and noise which unreasonably interferes with the transmission of messages for ordinary distances. The number of subscribers on any one line shall not be greater than that consistent with adequate service. Each utility furnishing service alone or jointly shall provide at least one line for through traffic on routes along which few or no subscribers' instruments are installed. Traffic studies shall be made to demonstrate to the commission that sufficient equipment is in use and that an adequate operating force is employed. At exchanges serving 500 or more subscribers 94 per cent of the calls shall be answered within ten seconds or less. At all other regular exchanges 90 per cent of the calls should be answered within ten seconds or less. At all exchanges operated in connection with other work slower service may be adequate.

Indiana Commission

The hearings on the petitions to revise rates of all the Indianapolis lighting and heating companies have been started before the Public Service Commission of Indiana. The first testimony related to the Merchants' Heat & Light Company, which has acquired the People's Light & Heat Company. Mr. Byron T. Gifford, chief engineer of the American Public Utility Company, gave the detailed exceptions of the Merchants' company to the appraisal of the property by representatives of the Indiana commission. The plant valuations of the company and the State follow: State valuation, replacement value $2,814,088, present value $2,349,792; company valuation, replacement value $3,937,000, present value $3,198,540.

Mr. Harry O. Garman, chief engineer of the commission, testified as to the methods he used in arriving at his valuation of the property of the Merchants' and People's companies. The largest differences between the appraisals were found in the transmission system of the Merchants' company.

The city of Indianapolis, which recently made a contract to light the city for the next ten years with the Merchants' company at rates below those charged by the Indianapolis Light & Heat Company during the last ten years, is represented in the hearing.

Ohio Commission

An order has been issued requiring every public utility in the State to file with the commission before Jan. 1 the certified valuation of all of its property which was requested some time ago.

Current News Notes

TONS FOR THE INDUSTRIES BUT NOT ONE LUMP FOR THE RANGE.—No coal is used in the households of Beirut, Syria, although coal, by tonnage, was the most important import of the city during the past year. The coal is all consumed by the railroads, and the electric-light, railway and gas companies.

* * *

TELEPHONE ORDER SYSTEM.—In the note on the convention of Edison sales managers published in the Aug. 29 issue it was stated that a paper on a telephone order system was presented by Mr. R. H. Wright, of Cleveland. This was an error, the paper which covered the new telephone order system on the contract department of the Commonwealth Edison Company of Chicago having been prepared by Mr. H. Wright, chief clerk of the contract department of the latter company.

* * *

SPECIAL TRAIN TO EDISON ILLUMINATING COMPANIES' CONVENTION.—Following the usual practice, a special train will be run from New York City, Sept. 13, to White Sulphur Springs, W. Va., where the convention of the Association of Edison Illuminating Companies will be held Sept. 15 to 17. The train will leave the Pennsylvania station, New York City, at 5.08 o'clock Sunday afternoon, Philadelphia at 7.36 p. m., Baltimore at 9.55 p. m., and Washington at 11.10 p. m., arriving at White Sulphur Springs Monday morning.

* * *

SOCIETY MEETINGS

OHIO COMMERCIAL MEN TO MEET AT TOLEDO.—The committee on new-business co-operation of the Ohio Electric Light Association will meet at the Elks' Club, Toledo, Sept. 17. Men connected with the sales departments of Ohio electric-service companies are cordially invited to attend. Mr. T. F. Kelly, Dayton Power & Light Company, Dayton, Ohio, is chairman of the committee.

* * *

JOVIAN ACTIVITY IN INDIANAPOLIS.—During the week of the Indiana State Fair, Sept. 7-12, at the metropolis of the State, "Made in Indianapolis" signs were conspicuous in down-town stores. The Indianapolis Jovian League took an active part in furthering this movement. On Jovian Day, Sept. 15, the Indianapolis members of the order plan a street parade, to be headed, it is hoped, by Governor Ralston and Mayor Bell, who are Jovians. Mr. Thomas A. Wynne is Jovian statesman in Indianapolis. Officers of the local league are: President, Mr. Fred H. Cheney; secretary, Mr. Norman A. Perry.

* * *

MEETING OF THE MUNICIPAL ELECTRICIANS.—The nineteenth annual convention of the International Association of Municipal Electricians will be held at Atlantic City, N. J., Sept. 15 to Sept. 18. The Hotel Isleworth will be official headquarters. Information will be presented on electrical affairs for municipalities by prominent municipal electricians of the United States and Canada. Connected with the convention will be an exhibition of electrical apparatus of interest to municipalities. A report will be presented by the committee appointed at last year's convention "to investigate and report upon regulation for high-voltage overhead circuits in cities, including methods of construction." The membership of this committee is: Dr. C. P. Steinmetz, chairman, and Messrs. Clayton W. Pike, Philadelphia; Howard Joslyn, Seattle; A. L. Pierce, Wallingford, Conn., and R. A. Smith, Norfolk, Va.

A New England Transmission System

Water-power and steam stations of Burlington (Vt.) Light & Power Company at Winooski, supplying electric service to Burlington, Richmond and the Barre-Montpelier district

AN interesting development of generating facilities and the inauguration of a high-tension tie-line service have been accomplished by the Burlington (Vt.) Light & Power Company at Winooski, about 3 miles east of the principal city served by the system. The original generating station at Winooski is situated between the rocky walls of a gorge in the

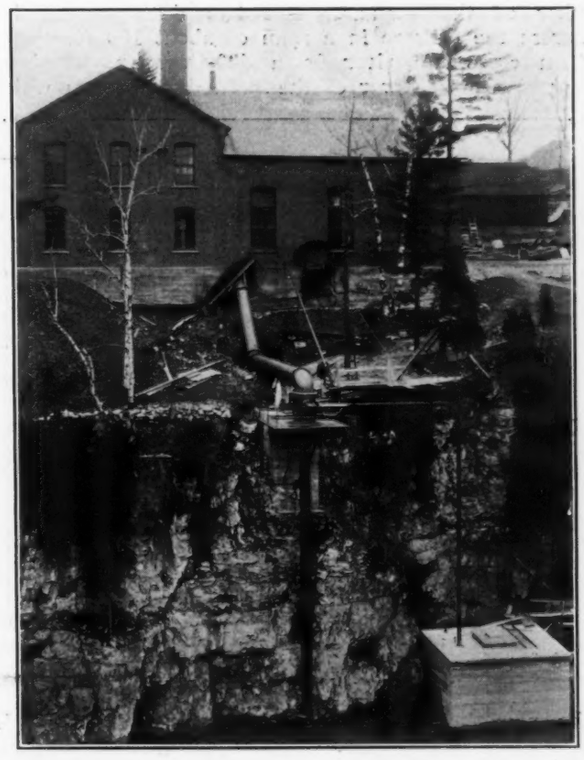


FIG. 1—EXTERIOR OF AUXILIARY TURBINE PLANT OF THE BURLINGTON LIGHT & POWER COMPANY

Winooski River, the end walls of the station being formed by the rocks bordering the stream, while the upstream wall of the building acts as a section of the dam or forebay retaining wall. In this station are three 500-kw, 2300-volt, three-phase, sixty-cycle General Electric revolving-field generators, the field coils being mounted on a common horizontal shaft sectionalized by clutches and belt-driven by four waterwheels, three of which are Platt Iron Works turbines, the fourth being a Hercules turbine. The wheels operate under a head of 30 ft. and two Lombard governors are provided for the plant.

Last summer a reinforced-concrete dam, 30 ft. high between the island termination of the power house and the eastern shore of the stream, superseded an old crib and stone dam formerly utilized. An auxiliary steam-turbine plant of 1000-kva rating has been built on the west bank of the river and a transformer installation made in connection with the transmission of energy at 13,000 volts to the town of Richmond, Vt., and at 33,000 volts to the Barre-Montpelier district, the latter being occupied by the Consolidated Lighting Company, which purchases energy from the Burlington company on a day-load basis. Transmission lines about 47 and 13 miles long respectively have been built to the Barre district and to Richmond, and a number of features of the Winooski installation illustrate a skilful development of the facilities afforded in the face of natural obstacles apparent in the accompanying photographs. At Essex Junction, 8 miles from Burlington, a reinforced-concrete dam is now under construction upon the Winooski River in connection with a new hydroelectric development which the company expects to complete in the near future, the present plan contemplating the installation of four 1500-kw generating units operating under a 65-ft. head. The dam will establish a reservoir about 0.5 mile wide and 3 miles long, and a portion of the developed electricity is to be transmitted to Barre, the remainder supplying the existing system of the Burlington company. The Essex Junction plant is to be built, with the dam, from the plans of Mr. J. J. Kennedy, consulting engineer, New York.

Description of Winooski Plants

Energy is generated at 2300 volts in the Winooski hydroelectric and steam plants, the transformers for the Barre and Richmond service being installed in a former oil room, with concrete walls, ceiling and floor, situated in the lower portion of the old station. The transformer room is 28 ft. long, 16 ft. wide and 11 ft. deep, and, as shown in Fig. 3, each unit is installed in a 7-ft. by 7-ft. compartment with a concrete wall 8 in. thick

FIG. 2—HIGH-TENSION LINES CROSSING WINOOSKI RIVER AND RAILROAD

between each pair of transformers. The 2300-volt connections are made at the top through taps from junction boxes connected by conduit with the station bus through overhead runs across the generator room. High-tension connections are made between transformers through insulating bushings carried through the walls as shown, and leads to the high-tension oil

switches, which are mounted on the floor above with the lightning arresters (Fig. 4), are carried upward through floor openings by short runs of bare copper. The Richmond service is handled by a 500-kva, three-phase General Electric transformer mounted on wheels,

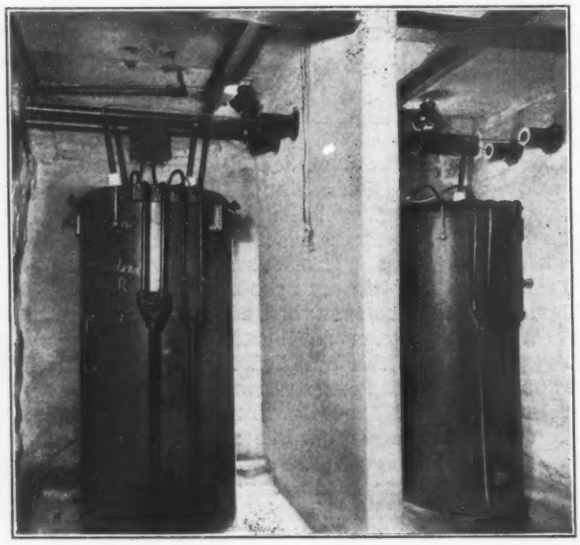


FIG. 3—TRANSFORMER COMPARTMENTS BUILT IN FORMER OIL ROOM OF OLD STATION

and the Barre line is fed by three Westinghouse single-phase transformers rated at 400 kva each. All transformers are water-cooled either by the local municipal service or by the river water, according to the cleanliness of the latter.

At the rear of the main switchboard, on a concrete gallery in the generating room of the hydroelectric station, connections are made as shown in Fig. 6 from the station bus through disconnecting switches and 2300-volt oil circuit-breakers to the leads of the Richmond and Barre transformers, a panel for controlling the Winooski street-lighting service being mounted at

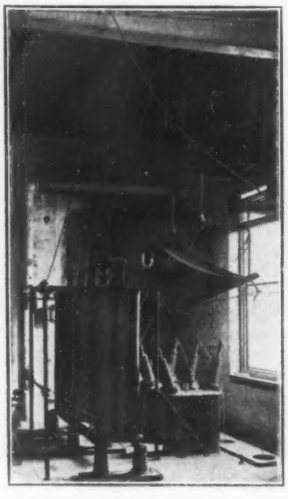


FIG. 4—LIGHTNING ARRESTERS AND OIL SWITCHES

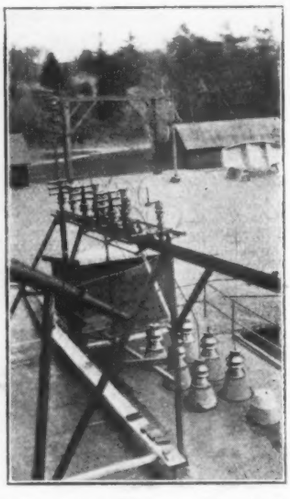


FIG. 5—ROOF BUSHINGS AND LINE-SUPPORTING STRUCTURE

the right. A clearance of about 3 ft. exists at the rear of the switchboard, which contains thirteen panels, the last two being for the control of the transformers and outgoing lines. The latter are carried upward from the high-tension oil switches to choke coils mounted under the ceiling of the switch room and thence through roof bushings (Fig. 5) to the top of the station, where a steel structure cares for the dead-ending of the outgoing lines and their necessary changes in direction in leaving the station. Each panel for outgoing high-tension line control contains a watt-hour meter, three ammeters, time-limit relay governing the operation of line switches, power-factor indicator, switch control buttons and pilot lamps.

Transmission Line to Barre

The Barre line is of No. 2-0 copper, the Richmond line being of No. 0 section. The former connects with the Consolidated Lighting Company's system near the Bolton Falls station of the latter. Throughout the run the line is of the pole type, 35-ft. cedar being used except near the Winooski plant, where the lines cross the river gorge and Central Vermont Railroad by spans attached to steel structures and towers by strain insulators of the three-disk type. Fig. 2 is a view of these spans. The two lines are carried across the tailrace in a span of about 100 ft. They then cross the river in a 400-ft. span, terminating at a steel tower of the latticed type from which

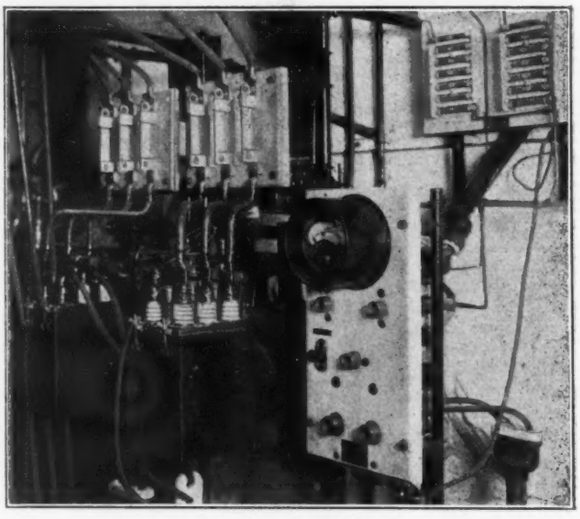


FIG. 6—CONNECTIONS FROM 23,000-VOLT BUS TO TRANSFORMER LEADS

the span of about 70 ft. across the railroad is started. The intermediate structure on the island is about 18 ft. high and 18 ft. wide, of the A-frame type with heavy diagonal bracing, the phase wires being spaced about 3 ft. apart. The towers are about 36 ft. high and are 30 in. square at the bottom, being anchored into 4-ft. by 4-ft. by 10-ft. concrete foundations by four 1.5-in. bolts in each case. The bottom angles are of 3-in. by 3-in. by ⅜-in. steel plate, and a ground wire is carried at the top of the tower and pole line. On the latter section the phase wires are supported by pin-type insulators with a 36-in. equilateral triangular spacing. The usual span is 125 ft.

Auxiliary Steam Station

The auxiliary steam plant is housed in a brick and concrete building 90 ft. long by 50 ft. wide, and the boiler equipment consists of the two 350-hp Stirling outfits having 343 ¾-in. tubes each, hand-fired, and provided with a Cochrane feed-water heater and two 9-in. by 5¼-in. by 10-in. Worthington feed pumps. Coal is delivered to a storage yard outside the station by cars on a railroad siding. From each boiler an 8-in. steam line delivers into a 14-in. header, from which a 6-in. pipe leads to the turbine, which is a

Westinghouse equipment operating at 3600 r.p.m. and discharging by a 36-in. exhaust pipe into a Westinghouse jet condenser on the face of the cliff outside the station, as shown in the exterior view (Fig. 1). The feed-pump exhaust is discharged in the usual manner into the heater. A 15-in. atmospheric exhaust pipe with automatic valve operating in case of the failure of the vacuum is installed in the turbine room with the usual roof exhaust head. Injection water for the condenser is forced into condenser head by a 40-hp motor-driven centrifugal pump installed in a pump house at the base of the cliff. The motor is a 220-volt Westinghouse induction outfit, running at 675 r.p.m., and the pump house is a 20-ft. by 15-ft. concrete structure 14 ft. deep. It is connected with the condenser by a 7-in. pipe 50 ft. long. A 25-kw turbine-driven exciter and a steam-driven Westinghouse air pump connected with the condenser by a 5-in. pipe are installed in the turbine room, which is illustrated in Fig. 7. At present the turbo-generator, which is a three-phase, 2300-volt machine, is connected with the switchboard in the hydroelectric plant by short cables run on poles, but a set of exposed ducts illustrated in Fig. 5 has been installed between the hydroelectric and steam stations for this purpose.

Handling the Outgoing High-Tension Lines

Fig. 8 illustrates the method of handling the outgoing 2300-volt lines and arc-lighting circuits at the Winooski

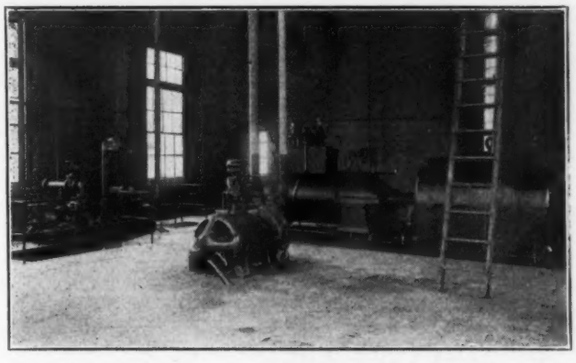


FIG. 7—INTERIOR OF AUXILIARY STEAM PLANT AT WINOOSKI

plant. As the station is at the bottom of the gorge, the roof is considerably below the surrounding highway grades and the outgoing lines leave at an angle of about 30 deg. with the horizontal. Each wire is therefore dead-ended on a double set of strain insulators attached to a channel-iron cross-arm about 6 ft. long, carried at the end of a steel frame about 15 ft. high, the frame being anchored into the roof by concrete piers and cross-braced longitudinally as shown. The principal members are 6-in. by 6-in. by 0.5-in. angles. The lines leaving the station building are carried up to the frame in conduit, and jumpers run from condulet outlets to the wires on the outside of the strain insulators complete the connection and provide drip loops.

The Winooski-Barre line is kept open at both ends during the night, the load being picked up at Burlington at 7 a. m. The switches at the Burlington end are opened from noon to 1 p. m., and the afternoon service extends from 1 p. m. to 4 o'clock. The line is left alive for lightning-arrester charging at Winooski until 5 p. m., when it is open-circuited until 6 o'clock the following morning. The closing of the switches at Winooski at the latter time energizes the line for arrester charging at the Barre end. The load taken by the Consolidated Lighting Company varies from 500 kw to 1000 kw and consists in large degree of power service in the granite quarries and stone sheds of the Barre-Montpelier district. It is usually unnecessary to operate the auxiliary steam plant at Winooski outside the summer period of low water extending from about July 15 to Sept. 1. Even in this period daily service is not required from the steam-turbine installation.

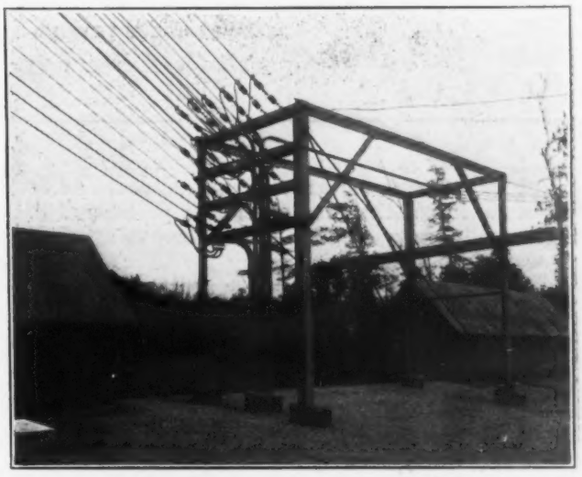


FIG. 8—ROOF FRAME AND OUTLETS OF LOCAL CIRCUITS FROM WINOOSKI

Central-Station Fixture Display

An attractive fixture display is a feature of the Burlington company's office building. A view of this is shown in Fig. 9. Two connecting rooms, 25 ft. long over all and 12 ft. wide, are situated at the rear of the general offices, one room being finished in robin's-egg blue and the other in dark weathered fumed oak. About 100 outlets are provided for fixture display in horizontal rows of 1-in. aluminum-coated pipes placed 18 in. apart on centers and 10 ft. above the floor, the wiring being run to the fixtures through these pipes from a fuse box placed near the floor in one of the inner walls. Ordinary T's in the pipes suffice for the fixture outlets. A center table, shelves and easy chairs add to the attractiveness of the room and facilitate the display of portable fixtures for desk and table service.

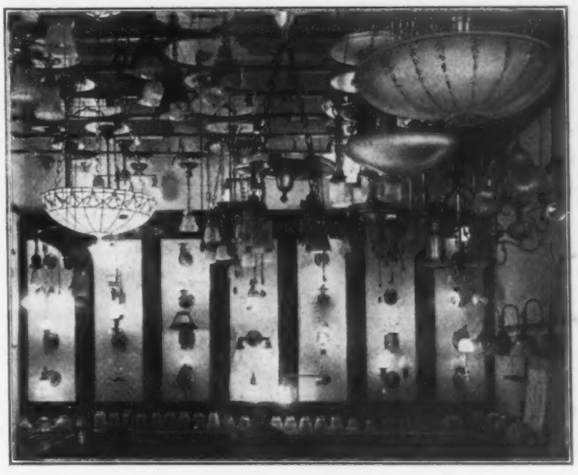


FIG. 9—FIXTURE DISPLAY OF THE BURLINGTON LIGHT & POWER COMPANY

In the illustration are shown seven wall panels with four outlets each, which are convenient in exhibiting brackets of various types. Switches controlled by pendent cords are installed in various conduit lines to permit convenient subdivision of fixture circuits.

Economy in Handling Peak Loads

Selection of prime-mover units for best operating results under various conditions of station load and available fuel supply. By Reginald Trautschold

IN operating a power house economically and efficiently one of the greatest handicaps to be overcome, if not the greatest, is the periodic demand for unusually heavy output. Particularly is this true in a power plant furnishing energy for electric lighting and motor service or in the power house of an electric-traction enterprise. Investigations of such plants show that by far the greater number are called upon to operate for six hours out of every twenty-four at fully 50 per cent higher efficiency than is required to carry the mean load. Such plants must and do depend upon storage-battery reserve to care for the high peaks or particularly heavy service, but this practice is not altogether economical, as shown by the fact that the generating units are driven at the full capacity of the plant only during the hours of heaviest demand for energy, the reserve equipment, whether constituted of independent units or represented by increased driving of certain generators, being pressed into service for only a few hours each day, notwithstanding the steadying influence of the storage batteries.

Steam Operation Versus Internal-Combustion Engines

Whether a steam plant or one operating with internal-combustion engines is the more economical is a question on which advocates of the two types of energy producers do not agree, nor is it the object of this article to express any opinion. Precedence, the high degree of perfection to which steam-operated units have arrived, and the belief (a disputed point) that high-grade steam engines and turbines are more reliable than the best internal-combustion engines, necessitate the consideration of the average power house as a steam plant. For such a plant the most economical machines unquestionably would be high-pressure Corliss engines and low-pressure steam turbines directly connected to electric generators. Considering a plant of 1000 kw with 500-kw reserve, a 1500-kw plant carrying a constant mean load of 1000 kw, the average service load and the duty of charging the storage batteries, and calling upon the 500-kw reserve for six hours per day to care for the heavy demand, as is typical of the average electric-lighting or electric-traction generating station, efficient equipment is tabulated in Table I. The average yearly fixed charges for such a plant are also given in the same table, with conservative figures for the "operating charge"—labor, attendance, oil, waste, supplies, etc. The fuel requirements per day are 75,000 lb. The total yearly cost of operation of such a plant, exclusive only of real-estate value and burden, with coal at various prices, is given in Table II. From this latter table the average cost of operating such a plant is seen to be $79,650, a record that is bettered, of course, in some exceptionally well-operated plants of similar size, but one that may be safely accepted as a fair average.

TABLE I—FIXED CHARGES, STEAM PLANT, 1500-KW STATION

Building, foundations, chimneys, etc. (item A)	$28,000.00
Equipment:	
Two 550-kw Corliss engine-generator sets with boilers, all accessories and auxiliaries	90,000.00
One 450-kw exhaust-steam turbine with generator, condenser and auxiliaries	23,000.00
Total cost of plant	$141,000.00
Yearly fixed burden (item B)	$22,560.00
(In estimating item B depreciation has been taken at 5 per cent, repairs at 2 per cent, interest at 6 per cent and insurance at 1.5 per cent of the total cost, and taxes at 2 per cent of three-fourths cost.)	
Operating charge:	Per Year
Attendance ($20 per day)	$7,300.00
Oil, waste, supplies, etc	1,875.00
Operating charge (item C)	$9,175.00
Fixed burden (item B)	22,560.00
Fixed charges 1500-kw steam plant	$31,735.00

TABLE II—TOTAL COST OF OPERATION, 1500-KW STEAM STATION

Coal per Ton	Total Cost of Energy per Year
$2.00	$59,110.00
3.00	72,798.00
4.00	86,494.00
5.00	100,182.00
Average	$79,650.00

Many plants very similar to the one considered are situated in districts where natural gas is readily obtainable, but where for various reasons, such as liability of interruption of the natural-gas supply, the use of coal as the plant fuel is found more advisable. In such localities it is frequently possible, though rarely done, to utilize the natural gas for fuel to run a gas engine in place of the reserve Corliss engine that is operative only during heavy-service hours. These heavy-service hours are usually pretty well known, but, nevertheless, some time is invariably required to place in operation the boilers that have not been in operation, or have been operated below capacity, during the hours of lesser load, so that the storage batteries must care for the increased demands for energy during the time occupied in putting the reserve steam unit into operation and while it is picking up its load. This dependence is not conducive to maximum economy.

Some Gas-Engine Advantages

A gas engine, on the other hand, can be started up quickly and can carry its full load almost instantly—certainly very much more rapidly than a steam engine can be pressed into service. Hence, in a plant using gas-engine reserve, the dependence on the storage batteries during a marked increase in demand for energy would be greatly reduced, and during hours of light service no stand-by losses from consumption of fuel would be entailed. Tables III and IV give the fixed charges, operating charge and the yearly average cost of operation of a plant in which a 550-kw natural-gas

engine, etc., is substituted for the 550-kw Corliss engine, etc., the reserve unit. The fuel requirements for such a plant are 8760 tons of coal and 14,600 cu. ft. of gas per year. Taking the price of both the coal and the natural gas at conservative values, the average yearly cost of operating such a combination plant should be in the neighborhood of $64,855, a saving of $14,795 over the all-steam power plant.

A plant operating entirely on natural gas would naturally show even a greater saving, but if any interruption or curtailment of supply should occur such a plant would be, temporarily at least, practically valueless. A combination plant, on the other hand, might not be affected at all by a curtailment of the natural-gas supply, the available supply of gas being sufficient to care for the limited gas-engine service required. A complete cessation of the supply would, of course, be embarrassing, but even under such conditions the plant could still furnish power in adequate quantities for at least eighteen hours per day, and during the six hours of heaviest load 66⅔ per cent of the power required would be furnished with no change from ordinary operating conditions, and this could probably be augmented to the full amount by forcing the steam equipment beyond its normal capacity, additional storage-battery equipment being possibly advisable.

TABLE III—FIXED CHARGES, STEAM AND NATURAL-GAS PLANT, 1500-KW STATION

Building, etc. (item A)	$28,000.00
Equipment:	
One 550-kw Corliss engine-generator set with boilers, all accessories and auxiliaries	45,000.00
One 450-kw exhaust-steam turbine with generator, condenser and auxiliaries	23,000.00
One 550-kw gas-engine-generator set with auxiliaries	33,000.00
Total cost of plant	$129,000.00
Yearly fixed burden (item D)	$20,640.00
Operating charge assumed to be the same as in the case of all steam.	
Operating charge (item C)	$9,175.00
Fixed burden (item D)	20,640.00
Fixed charges 1500-kw steam and natural-gas plant	$29,815.00

TABLE IV—TOTAL COST OF OPERATION, 1500-KW STEAM AND NATURAL-GAS STATION

Yearly Plant Charge	Cost of Coal per Ton	Fuel for Steam Equipment	Cost Natural Gas per 1000 Cu. Ft., Cents	Fuel for Reserve Equipment
$29,815.00	$2.00	$17,520.00	20.0	$2,920.00
	3.00	26,280.00	30.0	4,380.00
	4.00	35,040.00	40.0	5,840.00
	5.00	43,800.00	50.0	7,300.00
Average	.....	$30,660.00	.....	$4,380.00
Total cost of operation—average				$64,855.00

Points Concerning Combination Plants

A combination natural-gas and steam plant is possible only in quite limited sections of the country, however, the auxiliary fuel not being obtainable in all localities. Crude oil and fuel oil, on the other hand, can be transported practically anywhere, and, even with such oil commanding a price of 5 cents or 6 cents per gallon, oil engines may be employed to advantage as the reserve units in almost any power house of the class under consideration.

Tables V and VI show the average fixed charges, operating charge and yearly cost of energy production in a plant using the two fuels, coal and oil. The fuel requirements in this case are 8700 tons of coal and 120,450 gal. of fuel oil. With coal at the average price and oil fuel at the excessive price of 5 cents per gal., a plant in which the 550-kw reserve unit is an oil engine or engines would cost about $10,923 per year less to operate than one in which the reserve unit was an efficient steam engine of the Corliss type; with oil fuel at 6 cents per gal., the saving would be about $9,717. A similar all-oil-engine plant (see Table VII) operating on oil fuel at 5 cents per gal. would show an expense of $10,763 per year over that of the all-steam plant, an excess that would be quickly increased should the price of oil fuel advance. With oil fuel at 6 cents per gal., a price that has been reached in many localities and which may be expected to be current again, the cost of producing energy, though still considerably in favor of a combined steam and oil plant, would be $21,617 more annually than in the case of all-steam power operating on coal at the average price. In fact, an all-oil-engine plant would not compete with an all-steam plant, operating on coal at $3.50 per ton, unless the price of oil fuel was as low as 4 cents per gal., at which figure the balance in favor of the oil plant would be only $73 per year. The combination plant has still also another advantage over the straight oil plant, overcoming or discounting one of the main drawbacks to the latter type of plant; namely, the wide fluctuations in the price of oil fuel that seem bound to occur. Invariably oil may be purchased at a reduced price during some period and judicious buying then is, therefore, easier than when the larger supply for the complete fuel requirements of the plant has to be cared for. Oil does not deteriorate in storage.

TABLE V—FIXED CHARGES, STEAM AND OIL-ENGINE PLANT, 1500-KW STATION

Building, etc. (item A)	$28,000.00
Equipment:	
One 550-kw Corliss engine-generator set with boilers, all accessories and auxiliaries	45,000.00
One 450-kw exhaust-steam turbine with generator, condenser and auxiliaries	23,000.00
One 550-kw oil-engine-generator set with all accessories and auxiliaries	47,000.00
Total cost of plant	$143,000.00
Yearly fixed burden (item E)	$22,870.00
Operating charge assumed to be the same as in the case of the all-steam plant.	
Operating charge (item C)	$9,175.00
Fixed burden (item E)	22,870.00
Fixed charges 1500-kw steam and oil-engine plant	$32,045.00

TABLE VI—TOTAL COST OF OPERATION, 1500-KW STEAM AND OIL-ENGINE STATION

Yearly Plant Charge	Cost of Coal per Ton	Fuel for Steam Equipment	Cost of Oil Fuel per Gallon, Cents	Fuel for Reserve Equipment
$32,045.00	$2.00	$17,520.00	2.00	$2,409.00
	3.00	26,280.00	3.00	3,614.00
	4.00	35,040.00	4.00	4,818.00
	5.00	43,800.00	6.00	7,228.00
Average	.....	$30,660.00	High: 5.00 6.00	$6,022.00 7,228.00
Total cost of operation—average, oil at 5c. per gal				$68,727.00
Total cost of operation—average, oil at 6c. per gal				69,933.00

Data on Gas Producers and Engines

Installations of gas producers and gas engines to care for the reserve requirements of a plant subject to periods when heavy demands for energy must be met are of particular interest, as the producer equipment is here subject to the least advantageous conditions. For this reason producer-gas installations should receive great impetus toward more general adoption if they prove efficient under such trying conditions. Of course, the advocates of that method of energy production claim that it is as reliable as any steam generating apparatus, and if plants in which the producers are called into service only occasionally can show efficiency (as recent installations are doing) the internal-combustion engine operating on producer gas should eventually supplant the steam equipment in many plants. Assuming the same conditions as in the previous comparisons, the internal-combustion-engine equipment for taking care of the reserve power and the Corliss engine low-pressure steam-turbine equipment for the average load and charging the storage batteries, and taking into account the fuel losses of the producer during stand-by hours, the losses when blowing the producer, etc., Tables VIII and IX give conservative data for a consideration of the economic value of such a combination plant of the size under consideration and subject to similar service requirements. The cost of equipment is considerably more, as in the case where oil engines are employed for the heavy loads, than in the case where all generating units are driven by steam. The fuel requirements are 9670 tons of coal per year. The average yearly cost of operation of a plant of this character, assuming that the gas producer is operated on the same kind and grade of coal as the steam generators, would be about $66,528, a saving of $13,122 over that of the all-steam-power plant. The gas producer could probably be operated, however, on fuel that averaged as much as $1 a ton less than the fuel required for the steam boilers, and in such event the possible saving represented by the combination plant would be about $14,074. An all-producer-gas-engine plant would cost considerably more to install than any other type of plant that has been considered, but even with this handicap, authentic records of the cost of operation, etc., indicate that a producer-gas plant of the size under consideration and operated under similar conditions would be most economical, particularly if the cheaper fuel was utilized. Such a plant (see Table X) would cost only about $59,083 per year to operate—$20,567 less than the efficient all-steam-power plant, a saving of over 25 per cent.

TABLE VII—TOTAL COST OF OPERATION, 1500-KW OIL-ENGINE STATION

Building, etc. (item A)	$28,000.00
Equipment (complete)	141,000.00
Total cost of plant	$169,000.00
Yearly fixed burden	$27,040.00
Operating charge (item C)	9,175.00
Fixed charges 1500-kw oil-engine plant	$36,215.00
Fuel Requirements:	
Oil at 4 cents per gal	$43,362.00
Oil at 5 cents per gal	54,198.00
Oil at 6 cents per gal	65,052.00
Total cost of operation:	
Oil at 4 cents per gal	$79,577.00
Oil at 5 cents per gal	90,413.00
Oil at 6 cents per gal	101,267.00

TABLE VIII—FIXED CHARGES, STEAM AND PRODUCER-GAS PLANT, 1500-KW STATION

Building, etc. (item A)	$28,000.00
Equipment:	
One 550-kw Corliss engine-generator set with boilers, all accessories and auxiliaries	45,000.00
One 450-kw exhaust-steam turbine-generator set with condenser and auxiliaries	23,000.00
One 550-kw producer-gas engine generator set with complete gas generating equipment, etc.	50,000.00
Total cost of plant	$146,000.00
Yearly fixed burden (item F)	$23,360.00
Operating charge assumed to be the same as in the case of the all-steam plant.	
Operating charge (item C)	$9,175.00
Fixed burden (item F)	23,360.00
Fixed charges 1500-kw steam and producer-gas plant	$32,535.00

TABLE IX—TOTAL COST OF OPERATION, 1500-KW STEAM AND PRODUCER-GAS STATION

Yearly Plant Charge	Cost of Coal per Ton	Fuel for Steam Equipment	Cost of Coal per Ton	Fuel for Producer
$32,535.00	$2.00	$17,520.00	$1.00	$953.00
	3.00	26,280.00	2.00	1,905.00
	4.00	35,040.00	3.00	2,857.00
	5.00	43,800.00	4.00	3,810.00

Total cost of operation—average—one grade coal	$66,528.00
Total cost of operation—average—two grades coal	65,576.00

Flexibility of Equipment Desirable

Internal-combustion engines for the reserve equipment of plants which are subject to greatly varying degrees of load have considerable value, as has been shown. In the case of natural-gas engines this is to be expected, and the wisdom of the installation of such plants depends entirely upon the reliability of the natural-gas supply. If the supply is certain at all times of the year and is ample, the steam or partly steam-power house is not an economic one. When using oil engines for reserve, an interesting situation arises; namely, that it is economical to use such reserve units even when a plant operated entirely on such engines would be uneconomical as compared with a straight steam plant. With a combination steam plant and gas-producer reserve the comparative merits can be reliably ascertained. If the advantages are in favor of the producer plant, as the behavior of modern producers in plants of such size would indicate, the plant can easily be so remodeled as eventually to operate only on producer gas. That is, provision can readily be made for the adoption of gas engines and producers when the equipment of the plant has to be increased and the substitution of the gas equipment for steam equipment whenever the latter must be replaced.

TABLE X—TOTAL COST OF OPERATION, 1500-KW PRODUCER-GAS PLANT

Building, etc. (item A)	$28,000.00
Equipment (complete)	150,000.00
Total cost of plant	$178,000.00
Yearly fixed burden	$28,479.00
Operating charge (item C)	9,175.00
Fixed charges 1500-kw producer gas plant	$37,654.00
Fuel charge—average	21,429.00
Total cost of operation—average	$59,083.00

Artificial Illumination and Its Effect on Vision

Direct adaptation of retinal rods and cones for daylight and for after-dark seeing—Fatigue from artificial illuminants: Will a few more centuries immunize our eyes against it? By F. K. Richtmyer

THE deleterious effects of artificial illumination upon the eyes has long been recognized. At least as early as 1847 experiments were made to study the effect of radiation on eye media. Since that time the ever-increasing annual output of papers on the subject seems to point to a recognition of the fact that coincident with the increase in efficiency and intensity of modern artificial light sources has come an increasing amount of eye strain and kindred maladies, some of them vague and indefinite, but none the less serious, for they seem to indicate a pathological condition little, if at all, understood.

Perhaps the most natural place in which to seek an explanation of this baffling defect in our artificial illumination is in some property or peculiarity of the illumination itself. But experiments performed with systems of illumination which imitate daylight in every way possible, except as to intensity and spectral energy distribution, seem to result in the same eye strain. Quite recently Luckiesh and others have raised the question that eye strain may, in some manner, be caused by the relatively large proportion of infra-red contained in the spectrum of our artificial sources. Assuming that the coefficients of absorption of eye media are similar to those of water (for the longer waves at least; they are known to be different for ultra-violet), Luckiesh[1] computes that a large part of the energy from artificial sources is absorbed by the cornea, although no inconsiderable part reaches the retina. This same conclusion has been reached, qualitatively at least, by Vogt,[2] who showed experimentally that the infra-red energy reaching the retina from artificial sources is many times that represented by the rays within the visible spectrum.

Difficulties in the Way of Explanation

Promising as this suggestion may seem, there are three serious obstacles in its way: (1) It is difficult to correlate it with the fact that, in at least the large majority of cases, it is the ultra-violet and the shorter visible rays which are photo-chemically and photo-physiologically active, and we should not therefore expect the infra-red to cause changes of this character. (2) The simple absorption of heat from the light of artificial sources can hardly be, of itself, the cause of our defects in vision, since, on account of the much greater intensities encountered in daylight conditions, the total amount of heat produced in the eye media is of at least the same order of magnitude for the two kinds of illumination. (3) Neglecting errors of refraction, much of our eye trouble seems to be due to pathological disturbances of the retina, which, in the normal eye, receives per lumen only three or four times as much energy-flow from artificial as from daylight illumination. To be more specific, if we accept the data given by Luckiesh for the absorption of energy in the various eye media, we can easily compute how much of the incident energy (power) per lumen reaches the retina from the several sources considered. These data are shown in the accompanying table, and graphically in the appended curve.

From the last column of the table it is seen that the ratio of the energy received on the retina from a 4-watt-per-candle-power carbon lamp is only about six times ($0.047 \div 0.008$) that received from a black body at 5000 deg. C., and for a tungsten lamp only about three times. Taking into account the much greater intensities of daylight, it is seen that the difference in the amount of energy received on the retina is not so great as might at first thought be expected. Apparently heat production cannot be held accountable for retinal disturbances.

And yet the suggestion that eye trouble may be caused by the more refrangible waves of artificial sources seems to meet with the very obvious objection that our artificial sources are far weaker in ultra-violet, both in relative and in absolute measure, than is daylight, under which we can work with a maximum of comfort and efficiency, and which causes little or no eye strain.

But is it logical to expect that the difference in efficiency of our visual apparatus with daylight and with artificial sources must be due to some physical difference in the two illuminations produced thereby? Should we not also look to some difference in the receptive condition of the eye? When we find any deleterious effect on the human organism due to the peculiar exactions of civilization we are usually reminded that the *summum bonum* of existence will be obtained only by a "back to nature" movement. Accordingly are we not justified in raising the question, In what way do modern systems of illumination require our eyes to meet conditions to which primitive man was unaccustomed during the long period of evolution?

Duality of Structure and Function

The dual physiological structure of the retina—that is, the rods and the cones—coupled with experimental evidence of a very positive character, has led us to believe in a dual functioning of the eye: that the cones are used for daylight vision and the rods for the so-called twilight vision. This duplicity of structure and function seems perfectly in accord with modern conceptions of evolutionary development. During the countless ages when our visual apparatus was being developed two radically different intensities of illumination were encountered: (1) the exceedingly high illuminations of midday, and (2) the very low illuminations at night. It seems reasonable, therefore, to suspect that two sets of visual apparatus should have been developed to meet the two radically different intensities. Note that before the day of artificial illumination there was practically nothing between these two extremes. In this respect then, at least, we are imposing on the eye conditions which were not met during its evolution and for which, therefore, nature has made no provision, for the intensities customarily met in artificially illuminated rooms are midway between those of daylight and of night-time.

But the question might well be raised: What evi-

[1] *Electrical World*, Vol. 62, page 846 (1913).
[2] *Graefe's Arch. für Ophthalmologie*, Vol. 81, page 153 (1912).

dence of a physiological nature is there to expect that this moderate illumination, to which primitive man was unaccustomed, would produce harmful effects on the eye? As a possible answer to this question we will consider several bits of evidence which, while not at all conclusive, are at least suggestive.

C. Behr[3] reports clinical observations on four persons who were afflicted with disturbances of vision due to working under artificial illumination. Aside from errors of refraction, these patients complained of disturbances evidently connected in some way with the functioning of the retina, such as flickering, inability to see their work after looking for a short time toward the darker parts of the room, a diffuse gray sensation when coming into daylight from artificial light, and other symptoms of an indefinite nature. A determination of the adaptability-time curve for these patients showed that they possessed a sensibility far below normal. Thus, if we call the sensibility of the normal eye 10,000 (the reciprocal of the minimum observable illumination) after a forty-five-minute exposure to darkness, the sensibility of these four patients was, in round numbers, 1000 for the same duration of adaptation. At least one of the patients regained normal sensibility when he returned to daylight work. Experiments by Behr on patients from whom the lens had been removed[4] showed that this same depression of the adaptation curve could be produced by short exposures to ultra-violet radiation greater than 330. To appreciate the full meaning of this observation we must understand the physiological process by which adaptation is accomplished, as well as the process by which radiant energy is changed into visual sensation.

Obscurity of Physiological Processes

Unfortunately neither of these processes is at all clear to us. About the latter we know practically nothing. Regarding the former a reasonably good working hypothesis is based upon the "migration" of the dark pigment which is found closely associated with the rods and cones of the eyes of nearly all animals. Direct observation on microscopic sections of the excised eyes from recently killed frogs has shown that when the animal is kept in the dark this pigment crowds in around the base of the rods and cones, leaving the entire surface of these nerve ends free to receive light energy. When, however, the animal is kept in the light it is found that this pigment has pushed forward and has covered all but the tip ends of rods and cones, thus reducing the surface area upon which light may fall and consequently decreasing the sensibility. Although direct experiments on mammals have failed to show the migration of this pigment, observations by Klein[5] can be explained, readily at least, on no other hypothesis. The theory is at least a workable one, therefore, that in ordinary daylight vision only the tips of the rods and cones are exposed to radiation, while in twilight vision (that is, with the eye dark-adapted) the whole surface of the rods and cones is exposed.

We may, therefore, conclude that the rods and cones of primitive man were accustomed to work under only two conditions: (1) with the tip ends of the nerves receiving a high illumination and (2) with the whole surface of the rods (and cones) receiving a very low (night-time) illumination, excepting perhaps for a brief period after sunset and before sunrise.

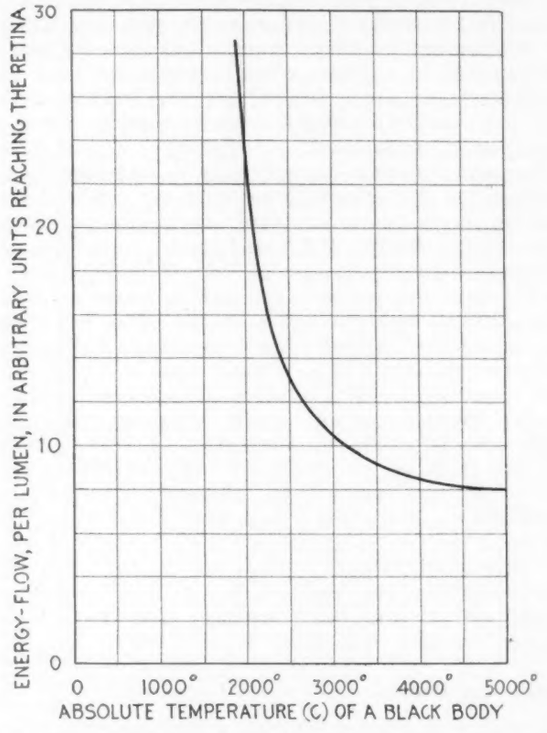
[3] "Beitrag zu der Frage nach den Veranderungen und Schadigungen des Auges durch Licht," *Graefe's Arch. für Ophthalmologie*, Vol. 82, page 509 (1912).

[4] The lens is opaque to radiation shorter than 375$\mu\mu$, but all other eye media are transparent to at least 330$\mu\mu$. So that with the lens removed radiation down to 330$\mu\mu$ would reach the retina.

[5] Fr. Klein: *Archiv. für Anatomie und Physiologie* (physiological section), 1911, page 339.

Now, it is well known that the eye, as used in artificial illuminations, is partially dark-adapted. That is, the pigment has partially receded, leaving a part of the upper portions of rod and cone surface exposed to an intensity to which, in primitive man and animals, it was not accustomed. Ought we not, therefore, to expect on this surface an effect—we can hardly call it a burn—somewhat like the sunburn produced on the city dweller when he goes camping? The guide, accustomed to outdoor conditions all his life, experiences no ill effects.

Of course, the skin readily recovers from sunburn and soon becomes immune. Why should not these upper parts of the rods and cones soon become immune to the effects of light relatively too intense? We can only suggest an answer: the skin, from its unprotected position on the outside of the body, must have been developed to meet rapidly changing conditions, and therefore readily adapts itself to new environments; whereas until very recently, from the standpoint of evolution, the sensitive parts of the retina have never been compelled to work under any but night-time illuminations. After a few dozen centuries of artificial illumination possibly our eyes will become immunized!



RELATION BETWEEN ENERGY-FLOW AND TEMPERATURE

Futility of Speculation

What this ill effect may be, or by what radiations it may be caused, it is of course idle to speculate. On the present theory, we should expect it to interfere with the mechanism of (retinal) accommodation by making a part of the rod and cone surface less sensitive to light, or, rather, less efficient in transforming radiant energy into visual sensation. This was indeed what Behr found. Furthermore, small as the quantity of ultra-violet energy in artificial sources is, to say nothing of the still smaller proportion which ultimately reaches the retina, it may yet be sufficient to cause a disturbance on such a very sensitive surface as the rod and cone surface must be, especially when we consider that photo-chemical effects are not necessarily dependent on the energy of the radiation which causes them. But it does not seem necessary to hold the ultra-violet

alone responsible. It may be that energy of any wavelength, of an intensity so many times that for which it was intended, falling on the exposed rod and cone surface of the partially dark-adapted retina would cause deleterious effects.

In this connection it is to be noted that many persons subject to eye strain and kindred disturbances of a seeming retinal origin work with perfect comfort in daylight. This would be expected. When the eye is light-adapted to the intensities usually met in daylight, the injured surface of the rods and cones is covered up and only the tip ends are functioning. These same people are fairly comfortable under a very weak artificial illumination—which again agrees with the theory here put forth.

Individual Preferences in Light Sources

There are those who, for the sake of comfort, prefer the carbon lamp to the tungsten; and even the old open-flame gas burner, with its still smaller proportion of blue, violet and ultra-violet, to the carbon. One case which has recently come to the writer's attention was that of a person who had been accustomed to work at a desk lighted by a 16-cp carbon lamp. The carbon lamp was replaced by a 25-watt tungsten, and immediately

TABLE SHOWING ENERGY-FLOW AND WATT-PER-LUMEN RELATIONS

Source	Watts per Lumen	Percentage Absorbed by Eye Media	Percentage to Retina	Watts per Lumen on Retina*
4-watts-per-cp carbon lamp....	0.385	87.9	12.1	0.047
1.25-watts-per-cp tungsten.....	0.126	80.0	20.0	0.025
Black body at 2000 deg. C.....	0.223	89.7	10.3	0.023
Black body at 2500 deg. C.....	0.0795	76.7	23.3	0.0185
Black body at 3000 deg. C.....	0.0310	65.1	34.9	0.0108
Black body at 4000 deg. C.....	0.0155	45.9	54.1	0.0084
Black body at 5000 deg. C.....	0.0115	30.5	69.5	0.0080

*The term "watts per lumen on the retina," as well as the corresponding term "watts per lumen absorbed by (the several eye media)," in the article referred to by Luckiesh, is really a misnomer if taken literally. It is really an abbreviation for the longer statement, "watts per lumen available as visual energy," only a small part of which reaches any one retina to be transformed in part into visual sensation. In other words, this column gives in arbitrary units the flow of energy per lumen reaching the retina, assuming (what we probably have no right to assume) that pupil opening is not affected by the spectral energy distribution of the source concerned.

eye strain began to be felt. After a time the carbon lamp was replaced and the eye strain at once ceased. It may be that the physiological reason back of this peculiar preference for "yellow" light—a preference which those of us who are scientifically inclined stigmatize by calling a "notion"—is based on some such effect as has here been suggested, namely, that the larger proportion of violet and ultra-violet in the whiter sources acts in a more harmful—or at least unpleasant—manner on those parts of the rod and cone surface accustomed only to night-time conditions, even though the intensities of illumination, photometrically measured, produced by the several artificial sources may be equal.

The above suggestions are recorded simply as possibilities to be established or—more likely—cast aside by future experimental work. Certain it is that, after much investigation in this field an explanation of the peculiar phenomena observed appears to be as far away as ever, and those who are working along these lines seem to welcome suggestions from any source which may serve to aid their efforts.

Hydroelectric Development and Irrigation

At the recent conference of United States Reclamation Service attorneys held at Salt Lake City, Utah, Mr. E. C. Finney, assistant attorney for the Reclamation Service, read a paper entitled "Hydroelectric Development on Public Lands in Relation to Irrigation," which presented the policy of the present administration in so far as it is governed by the legal representatives of the Reclamation Service. The author briefly outlined the history of irrigation both in this country and abroad.

In speaking of the reclamation measure now before Congress, Mr. Finney said: "The bill seeks to protect the investor, encourage investment and secure early development of the water-power resources under conditions favorable to the public, but it retains fee in or reversion to the United States for such use or disposition as may appear proper and expedient to the people and to Congress at the expiration of leasehold periods." Congress recognized the necessity for hydroelectric development in connection with irrigation in 1906 and then made provisions covering such developments. In waterlogged lands and marshes cheap electric energy is practically necessary in order to insure reclamation. The author pointed out that pumping by hydroelectric energy permits the irrigation of only those lands worth while, by dividing the work of irrigation among a number of successive stations. Besides the advantages of irrigation, electricity offers the farmer energy for lighting, threshing, sawing and many other kinds of labor. Electricity also assures the irrigator a steady flow of water and a saving of water and will probably be the means of inducing manufacturers to settle in the neighborhood, thus insuring a nearer and better market for farm products.

In closing, Mr. Finney stated that "Far-seeing statesmen propose to retain in the United States the ownership of these valuable power sites for the public lands and reservations, and to procure development through long-time and definite leases, thus retaining such control over the future as will enable the American Congress of that day and generation to make new and proper legislation fitting those times and their needs, and thus insuring the greatest and most enduring good to the people generally, but particularly to those of us whose homes are in the West and whose interest in water and its possibilities is direct and vital. With the full and wise development of the irrigation and power possibilities of the West, her opportunities for increased prosperity and well-being are boundless and will far outdistance the most vivid word picture of our Western boomers."

Electricity in Salt Lake's Wasatch Carnival

Electricity played a prominent part in the celebration of the annual carnival of "the Wizard of the Wasatch" at Salt Lake City, Utah, Aug. 25 to 29, the principal feature being the electrical pageants. The floats in the procession were built on motor-equipped flat cars furnished by the Utah Light & Railway Company, and more than 5000 lamps were used in producing the lighting effects. These lamps were for the most part concealed in coves and the light reflected against the face of the floats, producing beautiful effects in illumination and shade without revealing any exposed lamps. In the industrial parade of Wednesday the lighting company entered an electric-truck float showing Jupiter, thunderbolt in hand, in the foreground and at the rear Benjamin Franklin drawing lightning from the skies with his kite.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Central Station Boosts State Fair

The Arkansas Valley Railway, Light & Power Company, Pueblo, Col., has donated to the Colorado State Fair Association all of its contracted advertising space in the newspapers of the Arkansas Valley, including those published in Pueblo, Canon City, Cripple Creek, Victor, La Junta, Rocky Ford, Manzanola, Swink, Fowler and others. This newspaper space will be used for advertising the state fair, to be held in Pueblo Sept. 14-19, inclusive. In calling the fair to the attention of local merchants, the central-station company also has suggested that they co-operate with the movement by mentioning the state fair in their own advertisements.

Rural Electric Service in Central Indiana

To those who have watched the extensive growth of rural telephone service in the United States the ultimate solution of the rural electric lighting and motor-service problem reveals itself in the simple statement of fact that the farmer will have electric lighting and motors. Many utility operators have objected that rural electric service is impossible, urging that the cost of construction and maintenance makes it prohibitive. But in the earlier days of the rural telephone, when the company could not afford to make extensions, the farmer—the independent rural citizen—said, "I'll bear part of the cost." He did, and to-day he is still a satisfied telephone customer. Indeed, it might almost be said that his wife would not live with him if he discontinued his telephone contract.

Thus the electric-service man can learn a lesson from his telephone brother. He should liken the existing high-tension transformer lines (including those of interurban railway companies) to the telephone toll lines of twelve or fifteen years ago, and then he should recall how the telephone business grew from one small pay station in the village general store to an exchange of 1000 customers.

If these comparisons are made and the tendencies of the early telephone days are recalled to mind, the map reproduced herewith will be of unusual interest, for it shows how a progressive utility company in the central part of the Hoosier State is applying these lessons. Eighteen miles of rural circuit has already been built and is in operation, and 19 miles of additional line is either in process of construction or "proposed." The word "proposed" as used here means that practically all contract and franchise arrangements have been made and that the lines are but awaiting the coming of the construction crews. An accompanying table gives the names of the small cities interconnected, with their populations, the column headed "Customers" including the farmers who are connected up along the line.

TABLE I—DATA ON SMALL TOWN AND RURAL ELECTRIC SERVICE IN CENTRAL INDIANA

City	Population	Customers
Rossville	700	125
Cutler	175	50
Sedalia	400	50
Moran	250	35
Irvington	800	150
Middle Fork	70	20
Michigantown	600	65
Kirkland	750	150
Hillisburg	200	40
Sirclesville	200	40
Forest	500	60
Line north of Forest	.....	20
Russiaville	800	125
New London	140	35
Line west of Russiaville	.....	5
West Middletown	150	30
Alto	75	15
Center	250	50
Hemlock	250	50
Nevada	75	15
Other lines from Kokomo	.....	36
Greentown	1,100	175
Swayzee	1,000	125
Converse	1,200	200
Amboy	600	90
Point Isibell	150	30
Herbst	100	25
Other lines from Swayzee	.....	12
Total	10,535	1823

An enumeration of the principal features of the con-

"THE LITTLE FRAME COTTAGE" WITH ITS INDIVIDUAL STEP-DOWN TRANSFORMER

"THE BIG BRICK HOUSE" WITH ITS ELECTRIC PUMPHOUSE IN THE BACK YARD

FIGS. 1 AND 2—BRINGING ELECTRIC SERVICE TO THE FARMER IN CENTRAL INDIANA

tract under which this business is secured will be of interest as showing how the farmers and the company are working together. A minimum of five customers is required for each mile of new extension. The cost of the line complete is guaranteed not to exceed $300 a mile, tracts within a distance of a mile and one of these customers desires to use a 1-hp motor, the basis of settlement will be seven customers per mile, or $43 each. Rates for service are 12 cents a kw-hr., subject to a 10 per cent discount for prompt payment, with a minimum

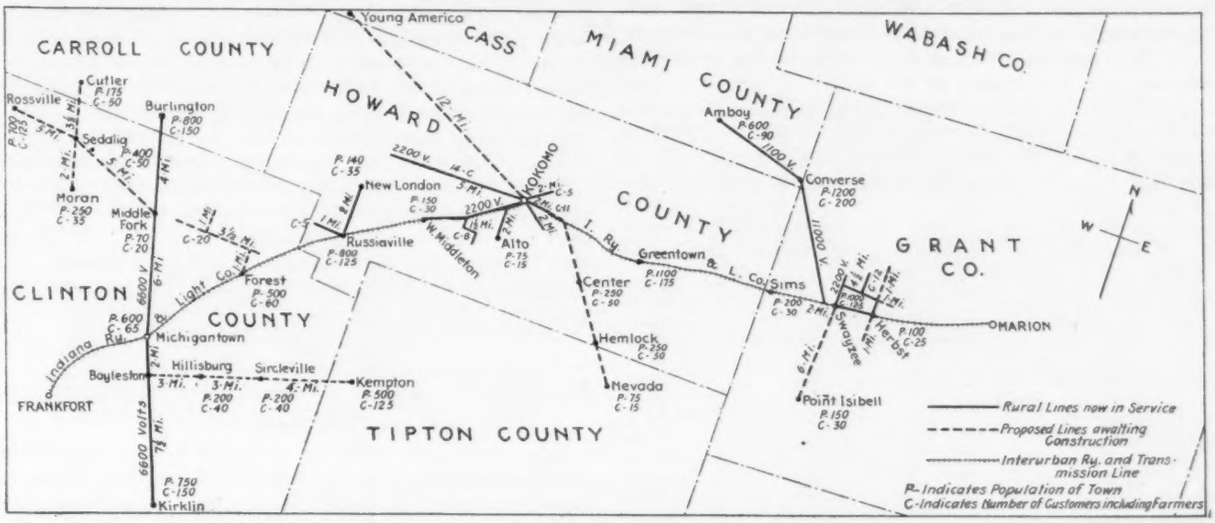
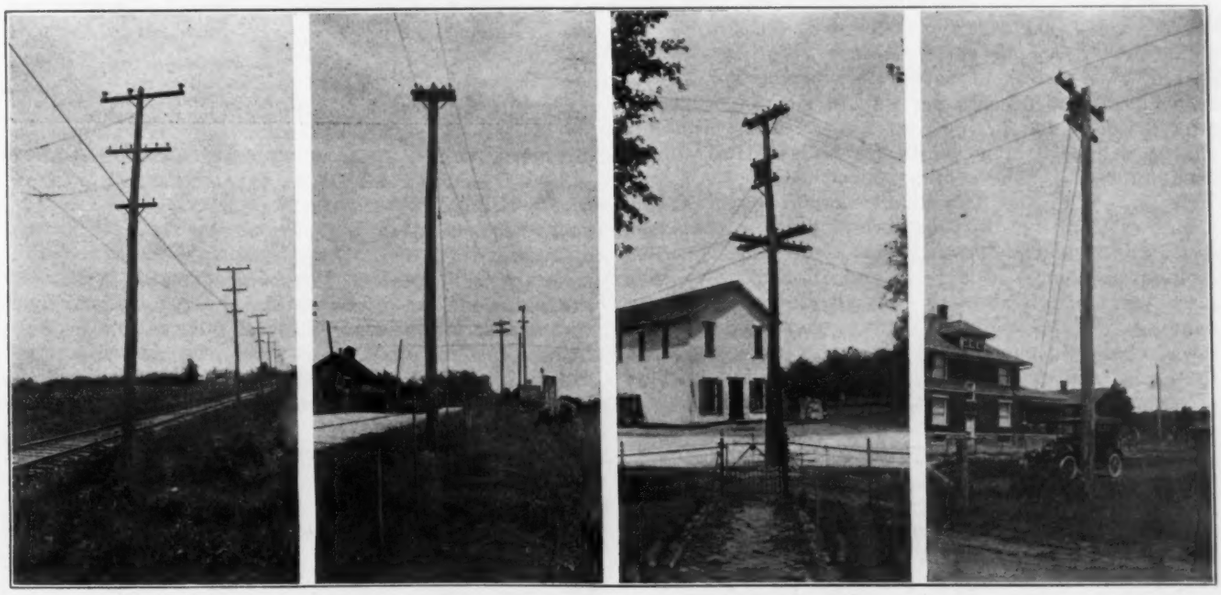


FIG. 3—MAP SHOWING EXTENSIONS OF ELECTRIC SERVICE TO FARMS AND SMALL TOWNS OVER THE LINES OF THE INDIANA RAILWAYS & LIGHT COMPANY

the company agreeing to pay all additional expense over and above this amount. Each customer must promise to pay his proportion of the cost of the line immediately upon its completion. The company collects no charges for electricity from any customer until his interest in the line is repaid in full; or, in other words, the company first earns the value of the line in service rendered to the customer before any energy charges are made. In case other customers wish connections before the line is fully earned by the company, each is required to pay his proportion to the charter members before service will be rendered. Any customer desiring to use a motor of 1-hp rating or larger is counted as two customers but is required to pay only as one customer. If, for example, six customers have signed contracts of $1 a month for all, except customers who have motors of 1-hp rating or larger. In the latter case the regular motor rate of 5 cents per kw-hr. prevails, with a minimum of $1 per hp per month.

Details of Line Construction

Line construction for this type of rural service has not yet been standardized, some of the rural lines being operated at 11,000 volts, some at 6600 volts and some at 2200 volts, with the latter two pressures predominating. In general, however, all lines are single-phase and are carried on cedar and cypress poles spaced thirty to the mile, porcelain insulators being used almost exclusively. Where two customers are within ten spans of each other they are served from the secondaries of a



RURAL-SERVICE LINE ON INTERURBAN RAILWAY SIGNAL-WIRE CROSS-ARMS

WHERE THE 2200-VOLT LINE LEAVES THE RAILROAD RIGHT-OF-WAY

CORNER POLE IN A CROSS-ROADS VILLAGE SERVED WITH ELECTRICITY

TYPICAL CUSTOMERS' SERVICE FROM RURAL DISTRIBUTION LINE

FIGS. 4 TO 7—BRINGING ELECTRIC SERVICE TO THE FARMERS IN CENTRAL INDIANA

single transformer; otherwise a single transformer feeding to a drop of No. 10 copper is used for each service. A table herewith shows the estimated cost of 6600-volt line construction on the line between Michigantown and Burlington, which are approximately 10 miles apart. Some of the types of customers' services are also shown in the accompanying illustrations.

Of the rural customer it may be said with truth that the external appearance of his house gives slight indication as to his availability as a "prospect." Along the lines of the company transformers are to be found in front of both little frame cottages and big brick farmhouses, and at many of the latter special pumping stations have been built in the rear to supply water to the house and barn. But the farmer who lives in the little frame cottage can also afford electric lights, as one of the illustrations herewith shows.

TABLE II—ESTIMATE OF COST OF 10-MILE TRANSMISSION LINE, MICHIGANTOWN TO BURLINGTON, IND.

296 30-ft. poles, at $4.05	$1,194.00
63,300 ft., or 11,970 lb., No. 4 hard-drawn copper wire at $0.17	2,034.90
91,800 ft., or 11,680 lb., No. 6 hard-drawn copper wire at $0.17	1,980.60
325 3-ft. cross-arms, at $0.35	103.00
975 insulators, at $0.04	39.00
30 lightning arresters, at $6.25	187.50
592 braces, at $0.05	29.60
Bolts and lag screws	15.00
10 1-kw transformers, at $20.75	207.50
25 meters, at $5.75	143.75
One-half transformer station in Michigantown	375.00
Transformer station at Burlington	225.00
Labor, approximately $45 per mile	441.00
Total cost	$6,975.85
By using cypress poles and No. 6 hard-drawn copper all the way this estimate can be reduced by	1,150.00
Or a total of	$5,825.85

Those who have been closely identified with the rural electric-service work of the Indiana Railways & Light Company near Kokomo, Ind., are Mr. T. C. McReynolds, secretary, treasurer and general manager; Mr. P. H. Palmer, engineer of construction, and Mr. O. M. Booher, contract agent.

Salt Lake City Employees Get Half Rate

The Utah Light & Railway Company has granted its employees a 50 per cent discount from its regular cooking rate so that hereafter the company's staff may enjoy a rate of 2 cents per kw-hr., subject to 10 per cent discount for prompt payment. The minimum charge will be $1 per month for all electrical energy used for heating and cooking purposes.

Employees of the Salt Lake company have enjoyed a half rate for lighting for several years. Announcement was also made Aug. 1 that electric heating and cooking appliances would be sold to employees at a price just enough above cost to cover the expense of handling. Mr. Joseph S. Wells, general manager of the company, in announcing the special rates explained that they are granted to employees for the purpose of encouraging and stimulating the use of electricity.

Fifty Thousand Electric Irons in Use in Detroit

The electric-appliance department of the Edison Illuminating Company, Detroit, Mich., reports that it sells electric flatirons faster than any other appliance. Toasters are the next in popularity. Since the first of April the entire city has been canvassed five times by the company's salesmen. It is estimated that there are now about 50,000 electric flatirons in use in Detroit.

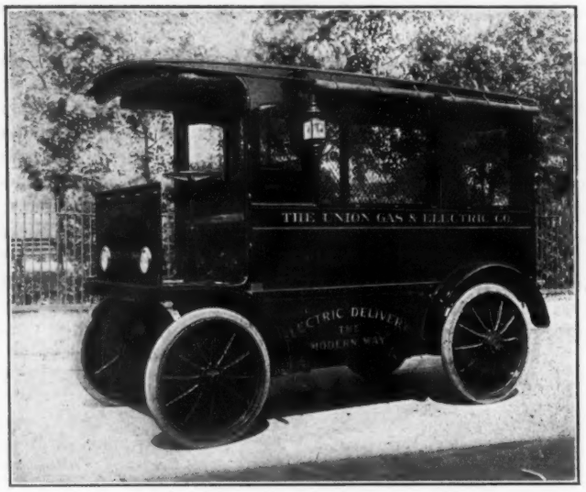
Central-Station Advertising in Motion-Picture Shows

The light and power department of the Fort Wayne & Northern Indiana Traction Company is now advertising electric service at Fort Wayne by attaching motion pictures directly to the end of regular reels used in the theaters about the city. These advertising film inserts were taken especially for the purpose and show outside views of the company's reconstructed power house, interior views of the turbine room, the switching gallery and one of the traveling cranes. Being attached to the regular films and thrown on the screen without interruption, following the regular pictures, the scenes are received by the public without the resentment generally found where advertising slides are shown. In addition, they are intrinsically interesting. Mr. M. V. Stagg, under whose direction this work has been carried out, says that the company expects a fair return from this general publicity.

Electric Truck for Delivering Appliances in Cincinnati

The "appliance company" operated by the Union Gas & Electric Company, Cincinnati, Ohio, has recently placed in operation a 1000-lb. electric truck to be used exclusively in the delivery of electrical appliances.

Mr. P. H. Kemble, manager of the electric commercial department, under which the appliance company is operated, has made a study of the costs of various methods of delivery of electrical appliances, including street cars, horses and wagons, and motor cycles. As the result of his investigations he has recommended this truck, which it is believed will take care of deliveries in Cincinnati and its suburbs, as well as Covington, Newport and several towns on the Kentucky side of the Ohio River served by the appliance company.



CINCINNATI'S NEW ELECTRIC TRUCK FOR USE IN DELIVERING ELECTRICAL APPLIANCES

The truck, which was manufactured by the Walker Electric Vehicle Company, is equipped with forty-two Philadelphia lead cells and a single series-wound 60/80-volt, 32-amp motor. It is designed for a speed of 14 miles to 15 miles an hour and will run 50 miles to 60 miles on a single battery charge. A feature of this truck is that it is equipped with a motor ordinarily used on a 1-ton truck, which will enable it to pull a maximum load up Cincinnati's hills with a relatively low energy consumption.

Illumination and Wiring

Deterioration in Cable Joints

BY WILLIAM A. KEATING

The accompanying illustration shows how deterioration takes place in a high-tension aerial-cable joint previous to actual breakdown. This joint was in an 11,000-volt, three-phase cable suspended on a railroad bridge. The joint was made in 1911, and was covered with varnished-cloth insulation and inclosed in a compound-filled iron sleeve with a vent pipe at the top. Its location on the bridge exposed it to the direct rays of the sun for the greater part of the day. The heat thus

DETERIORATION IN AN 11,000-VOLT CABLE PRIOR TO BREAKDOWN

generated caused the compound to liquefy and to ooze out through the vent pipe, until by the time the joint was removed, which was last spring, nearly half the compound was gone.

The charred insulation lay directly below the opening of the vent pipe. No trouble had ever been experienced with this cable, and its ultimate removal was caused by the rebuilding of the bridge.

The foregoing instance indicates the advisability of re-making aerial joints periodically. While the iron-sleeve type of joint is no longer used, the dry, lead-sleeve type has been found to show deterioration of the outer four or five layers of insulation after about five years of service.

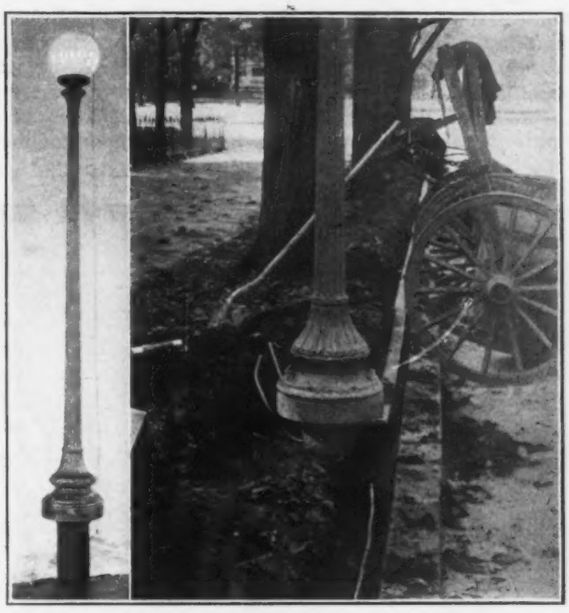
Ornamental Lamp Standards for Washington, D. C.

The city of Washington, D. C., is at the present time engaged in the completion of an installation of approximately 450 125-cp incandescent street lamps in its "downtown" or business section. The type of lamp now installed has been adopted by the city authorities as standard for incandescent lighting, and the present installation will replace a few old-style arc lamps and a large number of gas lamps.

Fig. 1 herewith shows the type of post which is being used for this installation. It is quite similar to those previously installed in the capital, excepting that the ornamental acorn top has been omitted. The same illustration shows that portion of the pole which is placed underground and the method of extending the wires up the pole. For a long time efforts have been made to do away with the acorn top, and in the present installation this was made possible by designing a receptacle for the bulb, in the form of a straight pipe which is attached to the top of the pole and extends midway of the globe. The simple globe without any ornamentation also presents a better appearance, and it is believed that the absence of the cast-iron top will prove most desirable.

The appropriation by Congress making available a fund for these new lamps will expire with the present fiscal year, and all of the new lights, it is believed, will be burning by that time. The District's electrical engineer, Mr. W. C. Allen, announces that a large number of additional lamps will be erected during the next fiscal year. Plans for this new installation are now being prepared, but will not be definitely decided upon until some time in the fall.

The new posts are 10 ft. 3 in. high, measured from the ground to the center of the globe. In some sections, as in front of the White House and on Pennsylvania Avenue, the posts are 12 ft. high. Alba globes are



FIGS. 1 AND 2—WASHINGTON POST AND METHOD OF INSTALLING

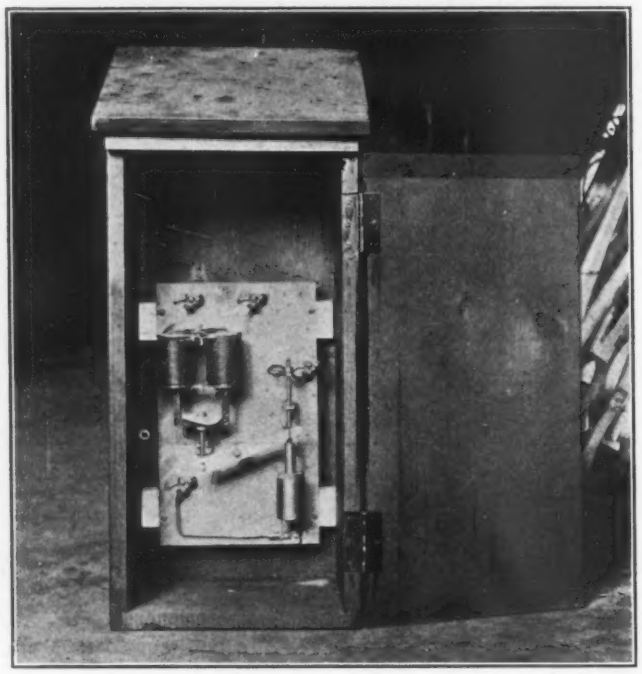
used, with 14-in. balls on the smaller posts and 16-in. balls on the larger ones.

Fig. 2 shows the unique method used for providing cable connections to the lamps. A trench about 8 in. deep and 6 in. wide is dug just inside and alongside the curbing. In this trench the cable is laid and on top of the cable is placed a narrow strip of board, about 3 in. in width, which serves as a protection to the cable. No hand-holes are necessary, as the cable is run directly up the pole without splicing. At street and alley crossings one-way conduit is used. This method has proved to be very economical as well as satisfactory.

Automatic Switch for Controlling Outlying Lamp Circuits

Some thirty of the automatic switches shown herewith, which were designed by Mr. J. A. Keniston, of the Cumberland County Power & Light Company, Portland, Maine, are now in service controlling lamp circuits on the company's lines. The switch proper consists of a pair of solenoids whose cores are attached with a lead sinker to a common cross-bar, the latter being connected by a short rod to a lever at the outer end of which is a vertical rod with a flexible wire at the top and a piston at the bottom. The piston is free to move up and down with the rod through a fiber washer at the top of a brass cylinder about one-third full of mercury covered by about 0.5 in. of oil. The solenoids are connected in series with the usual 6.6-amp street-lighting circuit, so that when the latter is thrown into operation at the station the plungers are drawn into the cores, removing the lever and making a contact in the cylinder between the mercury and the piston. The solenoid

coils were taken from an old General Electric arc lamp. The cylinder is 2 in. long and 1 in. in diameter. The lever is of fiber, 6 in. long, and all joints are made extra large to permit free play. In actual service these switches control from one to 120 lamps, according to location, and they are of particular value in parks and other places remote from the nearest substation. On tests, one of these switches has broken a current of 130 amp at 220 volts without damage. Many of the cluster-lamp switches in the Portland display-lighting installation are controlled by switches of this type, mounted in boxes hung on the back of a cross-arm by transformer lugs. Experience has shown the importance of drilling the mercury cylinder out of a single piece of brass, in order to avoid leakage of mercury through joints. The company now makes up these



SERIES SWITCH FOR CONTROLLING OUTLYING LAMP CIRCUITS

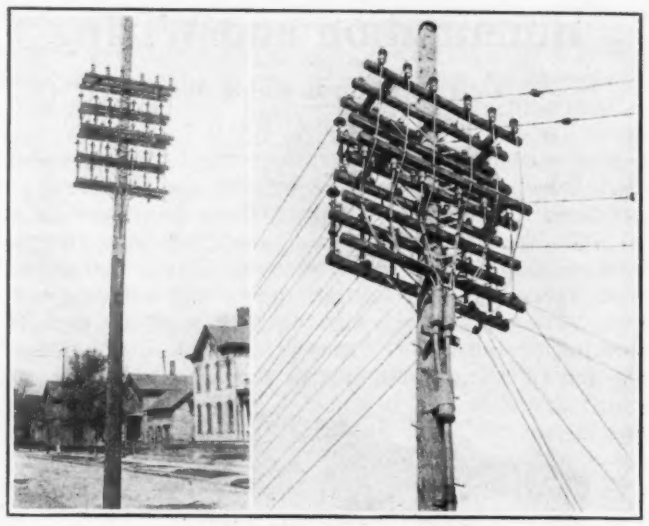
switches in its own shops for local service, and the cost per switch does not exceed $10. The device is not patented.

A Well-Built Terminal Pole

After traversing the "underground district" of Peoria, Ill., in conduit, the local series arc-lamp circuits begin their aerial travels from terminal poles designed for maximum neatness and strength. One of these poles, shown herewith, is typical.

From the conduit the lead-covered cable rises in an iron pipe along the face of the pole to a point a few feet beneath the lower cross-arm, the exit being sealed. Just above this point the circuits are divided into two groups each of which emerges from a separate pot-head. From these group pot-heads one set of conductors is led to each side of the pole, individual pot-heads sealing off the exit of each separate circuit. The systematic arrangement of the individual pot-heads on the cross-arms and the symmetrical disposal of the lead-covered cables leading to them give the pole a neat and workmanlike appearance.

Each of the six arc-lamp circuits radiating from this pole is equipped with a lightning arrester of the compression type. These arresters are mounted on the opposite side of the double arms from the pot-heads.



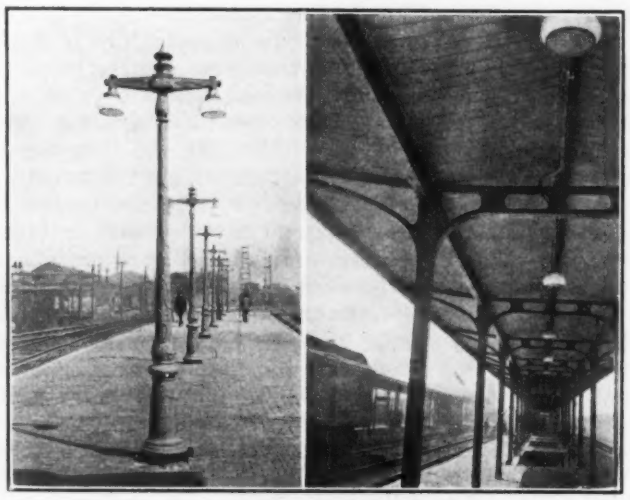
FIGS. 1 AND 2—A WELL-BUILT TERMINAL POLE

Correct alignment with proper anchoring makes the construction substantial and gives assurance of permanence.

Railway-Station Platform Lighting

Almost without exception the platforms of the older type of railway stations in cities of medium size might well bear improvement in the method of their illumination. However, an installation recently completed in the new station of the Pennsylvania Railroad Company at Fort Wayne, Ind., is a decided improvement along this line—an effort having been made to prevent the light rays from the lamp itself from falling directly upon the eye.

As will be seen from the two-lamp posts shown below, of which there are twenty-four placed in four groups of six each at the ends of the two platforms, the shades are open at the bottom but conceal the filaments of the 25-watt lamps from persons standing on the platform. A single row of eighteen similar fixtures equipped with 25-watt lamps has been used to light the shelter houses and open train sheds on the platforms. Tracks and passenger platforms at this point are elevated about 20 ft. above the street level, and the concrete stairways which lead to the station proper are illuminated with tungsten lamps in diffusing bowls. Throughout the entire station all light sources have been inclosed and naked filaments are everywhere concealed.



FIGS. 1 AND 2—RAILWAY-PLATFORM LIGHTING, FORT WAYNE, IND.

Lighting Fixtures with Staff Ornamentation

An appearance of well-to-do ease, dignity and comfort, coupled with economy in lighting expenditure, has been achieved in the lobby of the new Hotel Stowell, Los Angeles, Cal., through the use of modern tile in combination with mosaic and staff, and an original treatment of the lighting fixtures.

The architects, Messrs. Frederick Noonan and William Richards, of Los Angeles, having determined upon staff decoration of capitals and panels, considered it logical to extend the same treatment to the lighting fixtures, which, architecturally speaking, are ornamental units pendent from the ceiling.

The original conceptions embodied in the fixture are apparent in the illustration. The lower ornamental band just above the translucent glass segments conceals a horizontal septum with curved reflecting surfaces above and below. Lamps extend radially from the stem, immediately above and below the septum, and the light of the upper lamps is distributed vertically and horizontally by the plaster-reflecting surface above. The gallery or mezzanine floor shown also imposed the restriction of providing for its illumination and at the same time concealing from this viewpoint the illuminants and all mechanism. The solution was worked out in the dimensions of the reflecting surfaces and ornaments.

LOBBY OF THE NEW HOTEL STOWELL, LOS ANGELES

The vertical members produce upon the eye the pleasing effect of carrying the mass from the reflector to the ceiling—the fixture would look insufficiently supported if carried on only one central spindle. The main reflector and ornament above are made of a metal-reinforced plaster mix, the supports hooking into the metal reinforcements. The main reflector receives the light of four 60-watt tungsten units. Direct downward illumination is given from three 40-watt tungsten lamps mounted between the lower reflecting surface of the septum and the inclosing segments of ground glass. The glass is supported by metal bands with the staff ornament wired on. The mezzanine floor obtains direct lighting from the fixtures, which duplicate the lower part of the lobby type. The lanterns on pillars and pilasters, of staff on metal, harmonize in their octagonal design and ornamentation with the octagonal columns and ceiling fixtures. Each is equipped with one 40-watt tungsten lamp. The lanterns are kept lighted through the day for ornamental effect.

The ceiling panels, each containing one of the main fixtures, measure 20 ft. by 20 ft. and are 16 ft. above the ceiling. The lowest point of the fixture is 5 ft. 6 in. from the ceiling, and the top of the reflector is 3 ft. 6 in. from the ceiling. A panel near each end of the lobby is equipped with a stained-glass skylight, which transmits sunlight from the light court above. Lamps are set above the glass, around the panel, in such a way that they cast no shadow during the day and yet give good lighting through the glass at night. These glass panels carry ornamental fixtures, like the others, but normally their lamps are not operated.

The feature of the installation, as already pointed out, lies in its demonstration of the handsome effects which can be produced at very low cost by skilful and harmonious treatment of ceiling and fixtures in staff, a combination which is particularly suitable for the production of fine polychrome effects.

"White Way" for Boston Retail District

An installation of "white way" lighting will shortly be made in the Scollay Square-Tremont Row district of Boston, a contract having been made with the Somerset Company, Inc., for the lighting of the retail section between Pemberton Square and Somerset Street by magnetite lamps of the ornamental type. The district has been losing prestige which it is trying to regain.

Letters to the Editors

A Chance for Comparative Data

To the Editors of the Electrical World:

SIRS:—In commenting on the Alton (Ill.) station of the East St. Louis Light & Power Company, described in the *Electrical World* of Aug. 15, 1914, the writer of your editorial omitted mention of what seems to me a very important feature of this station, namely, the possibility here presented for securing in actual practice data concerning the comparative cost of energy purchased at wholesale from a distant hydroelectric plant and energy generated in a modern steam station equipped with ample apparatus for testing. Surely the central-station company operating this property has not overlooked this opportunity, and at a future date, when the station has been in operation for a sufficient period, the presentation of such data would be not only interesting but highly instructive.

Chicago. J. S. MITCHELL.

Universal Electric-Vehicle Charging

To the Editors of the Electrical World:

SIRS:—Referring to your editorial calling attention to the need for more charging plugs for electric vehicles and trucks (*Electrical World*, June 27, page 1469), why not build vehicle motors with two commutators? With such an arrangement and with the motor provided with a commutating switch and a clutch to disconnect it from the shaft when not driving the car, could not the battery be charged through its own motor from any 110-volt direct-current source?

Chicago, Ill. L. E. GOULD.

[Carrying our correspondent's idea a step further, the windings of the vehicle-motor armature might also be brought out to slip-rings, thus enabling the machine to act as a converter to furnish direct-current energy to its battery from any alternating-current source. A shunt-field winding would, of course, have to be added, and this could be energized by the vehicle battery.—EDS.]

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Combination Gas-Engine and Steam Generating Sets for Ford Factory

In the combination gas-engine and steam plant being built for the Ford Motor Company at Highland Park, Detroit, Mich., each generating set will consist of a two-cylinder tandem gas engine and a compound tandem condensing steam engine connected to a single shaft in a manner similar to that used in a cross-compound steam engine. A 3750-kw electric generator will be connected direct to the engine shaft. Each engine will be capable of developing 6000 brake-hp.

It is claimed that this combination "gasteam" engine, as it is called, will give the economy of a gas engine and the reliability of a steam engine. As a gas engine operates most efficiently when fully loaded, the set will be so designed that the gas side will always be working at full load. Except for overspeeding, there will be no governing on the gas side, all governing otherwise being done on the steam side. In case of trouble on the gas side, the steam side, it is declared, will be able to pull the entire load with a late steam cut-off.

The two gas cylinders of the engine will be of the four-cycle, double-acting type and will be water-cooled. Each cylinder will be 42 in. in diameter and will have a stroke of 72 in. The tandem compound condensing unit will have a high-pressure cylinder 36 in. in diameter and a low-pressure cylinder 68 in. in diameter and will operate with a stroke of 72 in. The low-pressure cylinder will be connected to a surface condenser, which in turn will be placed in a closed heater. The vacuum will be regulated to correspond to atmospheric temperatures. During the winter months the vacuum will be reduced to about 18 in. The entire amount of circulating water will be pumped through all the factory buildings, which are heated by hot water.

Superheated steam will be used with a pressure of 175 lb., and the high-pressure cylinder will be equipped with poppet valves, while Corliss valves will be employed on the low-pressure cylinder. The exhaust from the gas engine will be conducted into a steam superheater placed in the steam line between the high-pressure and the low-pressure steam cylinders, thus utilizing waste gases for reheating the high-pressure exhaust steam. Part of the exhaust gases will be shunted through the jacket of the high-pressure steam cylinder, which accordingly will eliminate any steam-heat loss in that cylinder. The exhaust gases will then be conducted to the boiler-feed water heater and will heat all the feed water required for the steam boilers. Feed water for the heater will be secured from the water used for cooling purposes in the gas-cylinder jackets, where it will be brought up to temperatures of from 150 deg. Fahr. to 180 deg. Fahr. This water will finally be raised to a temperature of about 250 deg. by means of the exhaust gases as previously mentioned.

The Hoovens, Owens, Rentschler Company, Hamilton, Ohio, is the manufacturer of these combination gas-engine and steam sets. The electric generators were made by the Crocker-Wheeler Company, Ampere, N. J.

Apparatus for Operating 11,000-Volt and 13,200-Volt Equipment in Parallel

To facilitate parallel operation of the 11,000-volt equipment in the generating station at Camden, N. J., with the rest of its electric-service system, which operates at 13,200 volts, the Public Service Electric Company of New Jersey employs auto-transformers whose voltage ratios can be changed by an ingeniously designed remote-controlled switch. By varying the transformation ratio of these transformers it is possible to compensate for voltage drop between stations as well as to regulate the load carried by each.

Three auto-transformers each having thirteen taps are arranged as shown in the accompanying diagram. The units are connected in star; the eleven end-taps

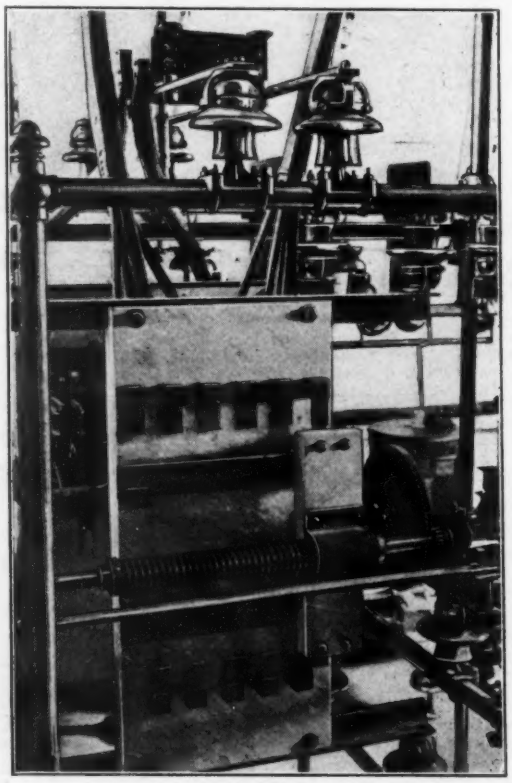


FIG. 1—ONE OF THE SLIDING CONTACT PANELS

from each are joined with as many contacts on three distinct marble panels, while the intermediate taps from each transformer are connected with the 11,000-volt buses.

The switching equipment consists of the marble contact panels (previously mentioned) arranged in a single vertical plane in front of which is a sectionalized threaded rod carrying three sliding contact blocks. Operated in conjunction with each panel are four circuit-breakers actuated by the screw rod. The auxiliary apparatus consists of travel-limit switches, a motor for turning the screw rod, and switches installed remote from the apparatus to control the sliding-contact switch.

The motor is connected with the screw rod by means

of sprocket wheels and a chain. The rod is divided into three sections by insulated-disk couplings. Geared to each section is an auxiliary rod operating the circuit-breakers referred to before. The stationary contacts on each panel are staggered as shown in the illustration and connection is made between any one of

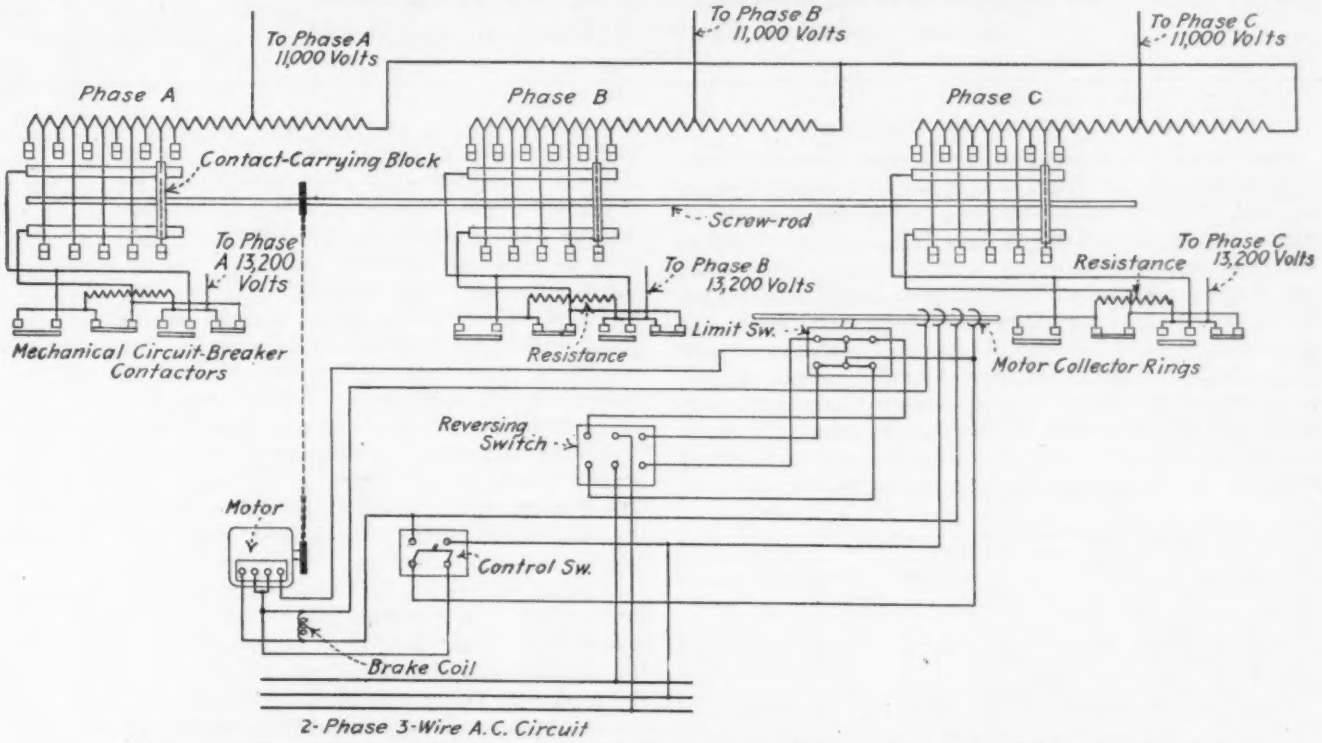


FIG. 2—CONNECTION OF APPARATUS FOR PARALLELING 11,000-VOLT AND 13,000-VOLT EQUIPMENT

them and the same phase of the 13,200-volt bus by two sliding contacts fastened to a marble block attached to the screw rod.

In changing the connection from one contact to another it is desirable to prevent interruption to service and still not short-circuit any turns in the auto-transformers. This is accomplished by arranging the stationary contacts or lips so that one sliding contact will remain in contact with a lip until the other contact engages with the next consecutive lip. The sliding con-

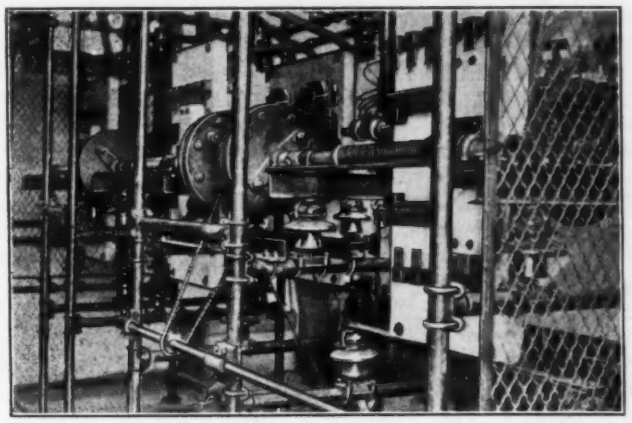


FIG. 3—TRANSFORMATION-RATIO CHANGING SWITCH

tacts are connected by a resistance during the transition, this being accomplished by the circuit-breakers indicated in the wiring diagram. When a contact finger is squarely over a lip the resistance is shunted and direct connection is made between the lip and its respective 13,200-volt bus.

The motor operating the transformation-ratio-changing switch is started by closing both the control and reversing switch. As soon as the motor starts, the control switch is opened and the motor continues to run until the current is interrupted by half-circle slip-rings on the motor shaft. These rings are placed so that the contact-finger blocks will stop directly over the lips. When the motor circuit is opened by these rings a magnetic brake is applied to stop further movement due to inertia. The switch can be operated by hand by disconnecting a clutch between the motor and the screw rod.

Testing Large Transformers Without Loading

Please describe an economical method of determining the efficiency of a large step-down transformer. H. L. T.

Data for plotting the efficiency curve of a transformer may be obtained without connecting the rated full load to the unit's secondary terminals, by determining the iron and copper losses as follows: The iron losses are obtained by energizing either the high-tension or the low-tension winding at normal voltage and frequency and measuring the power input into it with the other or secondary winding left open. This iron loss remains practically constant for all loads. The resistance or copper losses are determined by applying a relatively low voltage to the high-tension winding, the low-tension winding being meanwhile short-circuited, and gradually raising the pressure until full-load current flows in the high-tension circuit. By measuring the power input and current in each circuit for each change in the impressed voltage it is possible to determine total resistance losses with different current values. The power input consists of the resistance losses plus the core loss corresponding to the reduced voltage, but as the latter is only a small fraction of the pressure normally applied to the primary terminals the wattmeter readings may be assumed to give the resistance losses only. The efficiency at various loads may then be computed from the losses at the current values corresponding to those loads, remembering that the efficiency is equal to the output in watts divided by the output plus the iron and copper losses also expressed in watts.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Equalizing Connections on Compound Direct-Current Generators.—E. P. Hill.—A frequent source of trouble, and even of serious damage, to expensive electrical plants lies in the incorrect knowledge of the function and position of equalizing connections. The usual switchboard equipment consists of a double-pole switch and a single-pole circuit-breaker, together with the usual meters, etc., for each machine. Should, in the existing plant, the equalizer main be on the positive side, it is frequently found that the circuit-breaker is arranged in the new plant on the positive side, and trouble will develop from the following causes. Referring to Fig. 1, if for any reason the circuit-breaker operates,

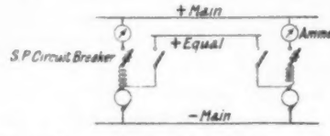


FIG. 1 — EQUALIZER WRONGLY CONNECTED

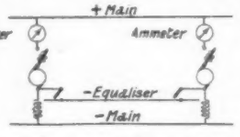


FIG. 2 — EQUALIZER RIGHTLY CONNECTED

the other machine will still be capable of receiving power through the equalizer main. The second trouble which arises in this respect is that the ammeter is usually connected in the same main as the circuit-breaker. The result is that, since the equalizer is on the same side, the ammeters are equalized independently of the actual loads on the various machines in parallel. The rule to be observed (Fig. 2) is that ammeters and circuit-breakers (if single-pole) must be connected up in the opposite polarity from that of the equalizer main, or their functions become useless when parallel running is attempted.—London *Elec. Eng'ing*, Aug. 20, 1914.

Alternating Electromotive Forces in Parallel.—A. E. Clayton.—A mathematical paper on the subdivisions of the current between alternators in parallel and transformers in parallel. The author points out that by the aid of the symbolic method due to Steinmetz problems connected with the parallel operation of sources of alternating currents can be solved as readily as similar problems connected with continuous currents. In the method given the equations deduced in their general terms would hold good for both continuous and alternating currents. The whole method is based upon sine functions, although if necessary with non-sinusoidal emfs each harmonic can be considered separately.—London *Electrician*, Aug. 14, 1914.

Polyphase Induction Motor.—H. Kafka.—An article, illustrated by diagrams, in which the author shows how to get from the ordinary Heyland diagram the exact circular diagram for the polyphase induction motor, taking into consideration the primary resistance and the iron losses.—*Elek. u. Masch.* (Vienna), July 12, 1914.

Generation, Transmission and Distribution

Hydroelectric Stations in Norway.—The list of large industrial ventures based upon a continued exploitation of Norway's water-power is steadily increasing. Thus a large power station with a rating of some 50,000 hp is being laid out at Folla River, an auxiliary to the Surna, in the Surendale. The building of another hydroelectric power station has just been decided upon, the cost of exploitation and transmission amounting to about $975,000. The power will be derived from the Högfos Falls and will amount to some 25,000 hp, which is to be transmitted to the town of Tisör, a distance of about 30 miles. The Arendal Water-Power Company, which is already in operation, is to be greatly extended, at an outlay of $1,200,000, and the Bjölvo falls are to be developed. A Norwegian journal of some standing has recently given expression to some apprehension of an overproduction of hydroelectric power stations, more especially as far as the electrochemical industry is concerned. Only a few years ago it was difficult to find uses for ratings of 5000 hp to 10,000 hp in this industry, but such ratings no longer count for anything. Now the installations and projected schemes comprise ratings of 50,000 hp, or even several hundred thousand horse-power, in Norway, Italy, Spain, Savoy, Canada and even Iceland. As far as Norway goes, not only are the installations already in operation at Rjukan, Tysse, Arendal, etc., being extended, and that on a large scale, but schemes are being proposed at Sande, Matre, Tyin, Aura, Take, Lysefjord, Bölve, Höjangen, Osa, Glomfjord, etc. If, say, only half of the projects just enumerated are completed within the next few years, the question presents itself as to where all this power shall be applied. The old or original electrochemical products—aluminum, carbide, ferro-alloys—all have limited areas of consumption, which no doubt grow every year, but even a small overproduction leads immediately to a decline of prices, and to business crises. Such have already arisen twice during the comparatively short span of the fifteen or twenty years which have passed since these manufacturers commenced operation, and experts are already prophesying a third crisis, with ruinous prices below the cost of production, as being near at hand. During the former crisis at least two Norwegian carbide factories had to stop. The losses were heavy, as the factories had to be sold for a song. On the other hand, the opinion is often expressed that the new atmospheric nitrogen-fixation industries—making artificial fertilizers—have an unlimited scope for the sale of their products. But this view must be accepted with considerable reserve. On the market for artificial fertilizers the consequences of overproduction are already felt. The quotation for Chile saltpeter dropped from $2.63 at the beginning of March to $2.39 on May 1, the market having been unable to receive the offered quantities of Chile saltpeter and artificial fertilizers. Nor does the position of sulphate of ammonia offer any encouragement, as German reports show.—London *Eng'ing*, July 3, 1914.

Conveying Plant in Iron Works.—An illustrated article on the conveying plant of the Trzynietz iron works of the Austrian Mining & Iron Works Company. The use of aerial tramways for conveying coke from the ovens to the furnaces, for loading, removing and piling blast-furnace slag and for loading the pig iron is described.—London *Electrician*, Aug. 14, 1914.

Speed Regulation.—E. Blau.—An article, illustrated by diagrams, on the regulation of the speed of large

three-phase motors in mines and metallurgical plants without regulation losses.—*Elek. u. Masch.* (Vienna), July 12 and 19, 1914.

Installations, Systems and Appliances

Electricity Supply in Great Britain.—A. H. SEABROOK.—The conclusion of his review of the development of electricity supply in Great Britain. In the present instalment the author deals with electric heating and cooking and with the endeavors now being made for the co-operation of British electricity supply stations with other industries.—*Elek. Zeit.*, July 23, 1914.

Outside Substations.—W. E. MITCHELL.—A profusely illustrated description, with detailed drawings, of the outdoor substations of the Alabama Power Company.—*Elek. Zeit.*, July 9 and 16, 1914.

Switchgear for Phase Advancers.—CHARLES C. GARRARD.—An article, illustrated by diagrams, describing the connections employed in switchgear for phase advancers. The author first deals with Kapp's phase advancer or vibrator and then with rotary phase advancers.—London *Electrician*, July 24, 1914.

Induction Motor Operation at Abnormal Frequency.—At the Mureaux plant a certain number of induction motors designed for 220 volts and fifty cycles will have to be operated at 220 volts but at a frequency of forty-one and two-thirds cycles. The author discusses how an abnormal frequency reacts on efficiency, power-factor, no-load current, etc. It is shown to be possible to operate a fifty-cycle motor from a forty-two-cycle network. The dimunition of speed can be remedied by a change in the gearing.—*L'Industrie Elec.*, April 10, 1914; abstracted in *La Revue Elec.*, July 17, 1914.

Wires, Wiring and Conduits

Fuses for Alternating-Current Circuits.—K. FAURE.—The fundamental equation determining the operation of a fuse states that the energy supplied to the fuse in a certain time is partly used for raising the temperature of the fuse and partly lost by radiation, conduction and convection. The energy supplied equals $Cdt + Atd\delta$, where C is the heat capacity of the fuse in calories per deg. C., t the temperature difference in deg. C. between the fuse and the surroundings, δ the time in seconds, and A the capacity of the fuse for giving of heat to the surroundings in calories per second per deg. C. The ratio T of C to A has the dimension of time and is called the "time constant." The author applies the general theory, first, to the case of direct-current fuses and then to the case of alternating-current fuses. Fig. 3 gives five heating curves for an alternating-current fuse. Fig. 4 gives five corresponding heating curves for a direct-current fuse. In both cases the abscissas represent the time and the ordinates the difference of temperature between the fuse and its surroundings. The five different curves in each case refer to time constants of 0, 0.5, 1, 2 and 5 seconds respectively. With direct

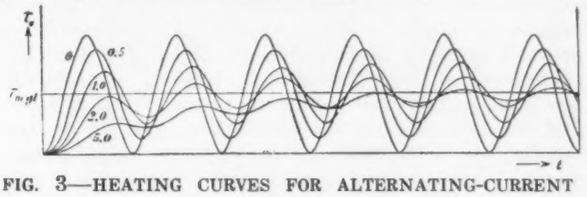


FIG. 3—HEATING CURVES FOR ALTERNATING-CURRENT FUSE

current the temperature of the fuse increases continuously, approaching a final limiting value. With alternating current the temperature fluctuates, although in the average it is constantly increasing, the more quickly the higher the time constant. While in practice the direct-current fuse reaches a final constant temperature, the temperature of the alternating-current fuse oscillates periodically around the final temperature value of the corresponding direct-current fuse. The maximum temperature reached periodically by the alternating-current fuse is, therefore, higher than the final temperature of the direct-current fuse. Since the maximum temperature and not the mean temperature determines the melting of a fuse, and since for the same effective

FIG. 4—HEATING CURVES FOR DIRECT-CURRENT FUSE

value the temperature becomes higher with alternating current than with direct current, a smaller current will suffice to melt the fuse in the case of an alternating-current system than of a direct-current system. The critical current intensity is therefore smaller for alternating current than for direct current. Hence fuses should be rated differently for direct current and for alternating current.—*Elek. u. Masch.* (Vienna), July 26, 1914.

Electrophysics and Magnetism

Powerful Magnet.—A COTTON.—An article describing the work which has been done so far on the project of installing a powerful magnet at the University of Paris to permit experiments with fields of 100,000-gauss intensity. The university has granted $10,000 for the purpose. Weiss and Cotton have proposed the construction of a very large electromagnet of the Weiss type weighing some 200,000 lb. Deslandres and Perot have proposed the construction of various apparatus of smaller size of their own design. The commission is in favor of the first project. The author gives a review of the whole subject of electromagnet design. He first discusses electromagnets without iron core. He examines the form to be given to the coil and the method of winding, and the energy necessary to produce a certain field in the interior. He next discusses means of getting rid of the Joulean heat in the magnet winding. He then takes up the design of an electromagnet with an iron core and refers to the work of P. Weiss, who makes use of ferro-cobalt for the central part of the pole pieces since in this way fields 10 per cent higher than with pure iron can be obtained. He then discusses the problem how to proceed in enlarging a given electromagnet design to one of much larger dimensions. In the second part of the paper details are given of the electromagnet design of Deslandres and Perot and of the electromagnet of Weiss with polar coils. He concludes that a magnet such as wanted by the University of Paris would cost $40,000, so that the available grant is not yet sufficient.—*Revue Gen. des Sciences*, July 15 and 30, 1914.

Units, Measurements and Instruments

Temperature Scale.—In the recent annual report of the (British) National Physical Laboratory it is mentioned that much correspondence has passed between this laboratory, the Reichsanstalt and the United States Bureau of Standards with regard to the establishment of a practical scale for measuring of temperature up to, say, 1100 deg. C., and that the three laboratories are in practical agreement with regard to this. The matter was brought before the International Conference on Weights and Measures, sitting at Paris in October last, by Dr. Stratton of the Bureau of Standards and by Sir David Gill, and it appears possible that international agreement as to a scale for practical use may be reached shortly.—London *Electrician*, June 26, 1914.

Telegraphy, Telephony and Signals

Automatic Telephone System.—An illustrated description of the Betulander relay automatic telephone system, which is being demonstrated in an installation in London. In this system no electromechanical devices are used, but connections are made entirely by relays. A special feature of the system is that the relays which select and indicate the idle junction and subscribers' lines, after performing their respective functions, are automatically cut out of circuit and are available immediately for building up other connections.—London *Electrician*, July 10, 1914.

Miscellaneous

The War.—An editorial pointing out that the German electrical and general commercial invasion of England, her colonies and numerous foreign lands has been due to the fact that the Germans made both the price and the quality "right." It will become necessary for Great Britain to manufacture materials heretofore imported from Germany. "That the present embarrassment of the German manufacturer and merchant will redound to the lasting good of the British electrical industry we firmly believe, but the reasons for the presence of the German in the market as now divulged must certainly not be disregarded over here. New methods, better and more accurate machine tools, the forcing up of the output to higher figures and production upon a 'world-market' scale may be mentioned as a few matters which will require the attention of the home manufacturer. We have been set a wonderful example in the science and art of production of every class and size of market throughout the world. Because Germany has been a great rival and a fellow aspirant to imperial, commercial and industrial honors she is not to be despised. Her diplomacy and her naval and military operations may be proved to be grievously at fault, but her achievements in the sciences and arts are undisputed and are worthy of emulation. This success has been largely due to thoroughness. The lesson for the British manufacturer of certain classes of articles, electrical in particular, can be learned now. If we fail to be taught by it, the handicap which the German people appear to have imposed upon themselves will, through our laxity, be removed in time, and opportunity to profit by it will be irretrievably lost."—The commercial and industrial section of London *Electrician*, Aug. 21, 1914.

Necessity of Making Certain Materials in Great Britain.—Henry Tinsley.—A letter pointing out that the time has come for British manufacturers to make and sell materials equivalent in price and quality to those heretofore made and sold by Germany. "Excellent ebonite, manganin wire and permanent magnets have undoubtedly been obtained from Germany, which it has been impossible to obtain of an equal quality in England, so far. . . . The one essential condition for manufacturers who are willing to launch out in this respect is that they should do their work thoroughly and scientifically, paying every possible attention to the electrical, mechanical and physical properties of what they manufacture. By so doing we might once more regain some of the smaller manufactures we could undoubtedly undertake, and not only produce equally good stuff for home consumption but obtain some of the foreign markets already held by the Germans."—London *Electrician*, Aug. 21, 1914.

Military Biplane.—A profusely illustrated description of the military biplane of the Allgemeine Elektricitäts Gesellschaft. Steel construction does not lead to a higher weight than wood construction. Seamless steel tube construction is largely used with oxy-acetylene welding. Each biplane unit consists of the biplane and an automobile on which all necessary equipment is carried.—*A. E. G. Zeit.*, June and July, 1914.

Electrical Exports from Germany.—Statistical tables showing the exports of electrical goods from Germany to different countries during the first six months of 1914 in comparison with the corresponding period of last year.—London *Elec. Review*, Aug. 21, 1914.

Tercentenary of Logarithms.—A long editorial giving an account of the recent Napier tercentenary celebrated in Edinburgh. A full account is given of Lord Moulton's inaugural address, and brief notices are added on the papers presented by J. W. L. Glaisher, G. Vacca, Gibson, Eugene Smith and Cajori.—London *Eng'ing.*, July 31, 1914.

Book Reviews

American Electricians' Handbook. A Reference Book for Practical Electrical Workers. Compiled by Terrell Croft. New York: McGraw-Hill Book Company, Inc. 712 pages, illus. Price, $3.

As the name implies, the book treats of American practice and is suited to the use of the electrician, the practical man, as distinguished from the electrical engineer, who has less frequently to carry out the details of construction. None the less it is a volume the electrical engineer may well have available for reference. The first requirements of a good handbook on any subject are that it shall give abundant information in practical form upon the subject it is supposed to cover and that the arrangement of the material and the indexing shall be such that the information may be readily referred to. This book fulfils both of these requirements to a remarkable degree. Numerous cross references in the text add to its general usefulness, the authority for much of the information is given, and the mechanical make-up of the book is in keeping with its other good features. The volume consists of six sections as follows: Fundamentals, generators and motors, outside distribution, interior wiring, transformers, and illumination. If any one of these sections were to be picked out for special comment, it appears to the reviewer that Section II, on the operation and management of electrical machinery, motors and generators, is especially complete and full of information of use to those who install and care for such machinery.

Handbook of Electrical Methods. Compiled from the *Electrical World*. 286 pages, illus. New York: McGraw-Hill Book Company, Inc. Price, $3.

A unique volume in which the construction methods and special "kinks" that have appeared from time to time in the *Electrical World* for the last three or four years have been brought together into form for ready reference. Only the methods which it is expected will prove of general use have been included, and these have been classified under the following heads: General notes; line construction and equipment; meters; operation of, and changes in circuits; switchboards and power house details; signs, display lighting; special lighting appliances; lamps and lighting circuits; signal-bell connections, etc.; transformers, oil switches and circuit-breakers; interior wiring; motors, motor switches, generators, etc. As these headings indicate, all of the more important departments of control, maintenance and operation are treated, and the book should prove of special interest to those in charge of the installation, extension and repairs of distribution systems. The index is complete and the information contained in the book covering any specific subject can be readily found.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Electric Range

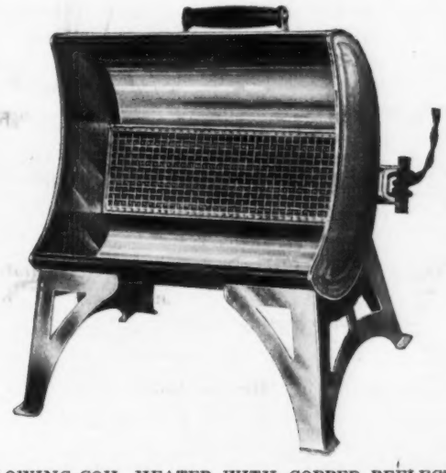
The range shown in the accompanying illustration is being made by the Rutenber Electric Company, Logansport, Ind. This range is formed of pressed steel and has nickel-plated trimmings. It is equipped with two

ELECTRICALLY OPERATED RANGE

8.5-in. hot plates, which are controlled by three-point switches. The oven measures 12 in. by 12 in. by 18 in. and is inclosed by insulated walls.

Luminous Heater

A heater of the glowing-coil-and-reflector type, designed for warming bathrooms, small offices and other small rooms, is shown herewith. The device is rated at 600 watts and can be connected to any lighting socket. It is made of pressed steel and is finished in polished nickel and black lacquer. The heat is thrown outward

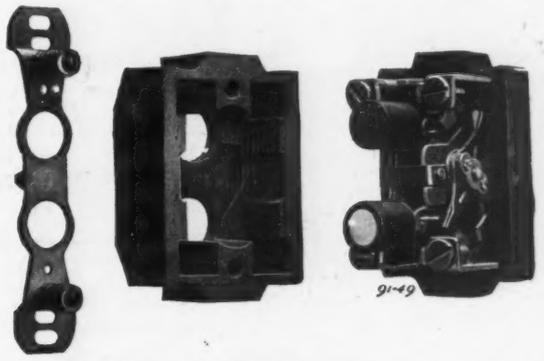


GLOWING-COIL HEATER WITH COPPER REFLECTOR

by a polished-copper reflector. The over-all dimensions are 10 in. by 12 in. by 12 in., and the total weight is 4 lb. The heater is equipped with handles so that it can be easily carried from place to place. This "El Radio" heater, as it is called, is being placed on the market by the Hotpoint Electric Heating Company, Ontario, Cal.

Push-Button Switch

A push-button switch with molded-insulation cover for the mechanism is shown with parts detached in the accompanying illustration. The supporting yoke shown in Fig. 1 is equipped with slots in the recessed ears

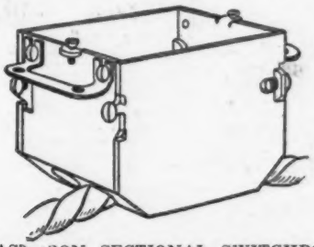


FIGS. 1, 2 AND 3—METAL YOKE, COVER AND MECHANISM

which are provided for any necessary adjustment. Spring-tension nuts for the face-plate screws prevent over-tightening of the screws or buckling of the face plate. The screws which hold the mechanism to the base are staked to a brass strip in a groove on the back of the base before being covered with insulating wax. This is done to prevent loosening of the screws. This switch is being manufactured by the Bryant Electric Company, Bridgeport, Conn.

Sectional Switchboxes

Cast-iron switchboxes designed for use with nonmetallic flexible and rigid conduit are being made by the Chicago Fuse Manufacturing Company, Chicago, Ill. The box shown in the illustration is used particularly in the rewiring of old buildings, as the beveled corners, the manufacturers declare, permit its insertion into small openings in the walls, thus making it easy to fish the ends of flexible conduit into the box. The box is equipped with four knock-outs, and two sides



CAST-IRON SECTIONAL SWITCHBOX

are removable. These sides are fastened to the box by means of a bent lug at one end and a straight lug at the other. A screw passing through the bent lug fits into a notch cut into one end of the box. The straight lug forms a part of the other end of the box; a screw through this lug fits into a pocket in the side piece.

Electric Conveyor Scales

Scales for weighing bulk material in motion are shown in the illustration herewith. The apparatus consists essentially of a short section of conveyor suspended from scale beams mounted in a heavy steel

BELT-CONVEYOR SCALE AND FRAME

frame. A corresponding length of the unloaded part of the conveyor is suspended from the scale on the opposite side of the fulcrum from the loaded part, so that its weight acts counter to the weight of the loaded part. In this way the tare weight is automatically deducted and the scale is self-balancing.

The operation of this apparatus is based on the principle that the total weight passing a point in a unit of time is proportional to the product of the average weight of a unit length of the stream and the speed of motion. The voltage of a dynamo is maintained proportional to the speed of motion, and the current is varied with the weight of the part of the conveyor suspended.

The rheostat is controlled by scale beams of the lever and knife-edge type. The counterpoise of the scale is a cylindrical plunger, which is partly floated in mercury. With every change in the weight on the conveyor the plunger instantly adjusts itself to a new position, thereby at the same time changing the level of the mercury. The rheostat consists of double-wound coils connected to contact points in the mercury chamber. As the mercury level rises or falls the resistance changes. The recording instrument may be placed either in a nearby office or close to the scales.

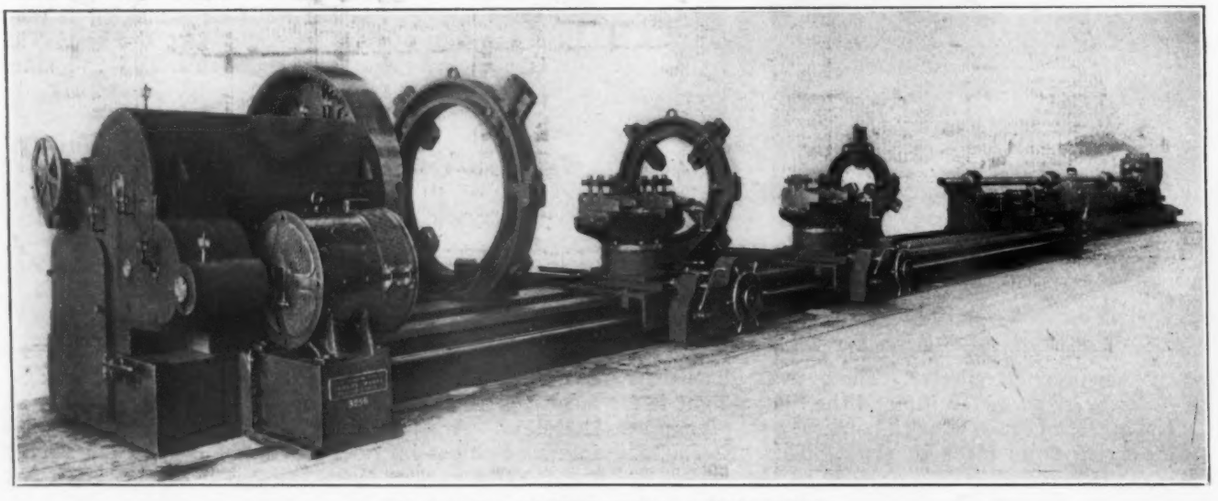
These scales are being made by the Electric Weighing Company, 180 Thirteenth Avenue, New York.

Large Lathe for Ordnance Manufacture

A 75-in. boring and turning lathe designed for use in the manufacture of 8-in. guns is shown in the accompanying illustration. The lathe is equipped with two carriages, a boring bench and a boring bar, and is driven by a 40-hp direct-current motor. The distance between the face plate and the boring bench is approximately 52 ft. The head-stock is a cored-out box casting 63 in. long on the bed and approximately 54 in. wide. The face plate is 75 in. in diameter and is securely fastened to a steel spindle. The over-all length of the spindle is approximately 67 in. The main bed of the lathe is approximately 73 in. wide across the top and about 64 ft. long. The total length of the bed, including a portion 26 in. wide extending under the boring bench, is approximately 110 ft.

The carriages have bearings on the bed 5 ft. long and are moved by 15-hp motors. The boring bench is 20 in. wide at the top, 24.5 in. deep, and approximately 56 ft. 6 in. long. The boring bar is of forged steel 7 in. in diameter and approximately 57 ft. long. The boring bar and boring bench are also moved by 15-hp motors. The boring bar is driven by a 15-hp motor mounted on the rear bearing and connected to the bar through gears. The machine is equipped with a motor-driven pump for supplying the cutting fluid through the boring bar. A 1-hp direct-current motor is used to operate this pump.

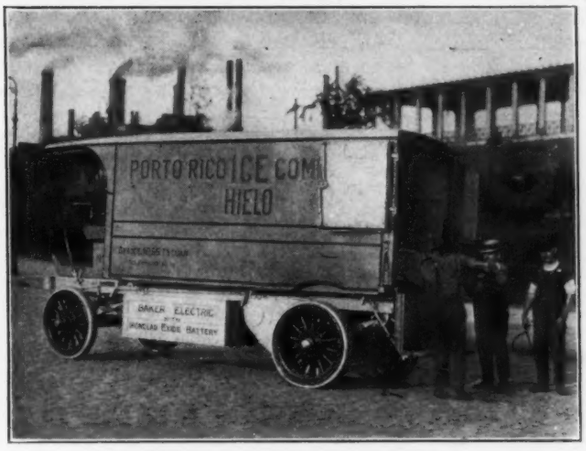
This lathe is one of three machines recently manufactured by Niles, Bement, Pond & Company, New York. All the motors were made by the Diehl Manufacturing Company, Elizabeth, N. J. Cutler-Hammer controllers are used throughout.



LATHE FOR MANUFACTURING 8-IN. GUNS

Electric Ice Truck

A 3.5-ton electric truck designed for hauling ice long distances in hot climates is shown herewith. The sides, the front and the roof are of double-panel construction, 4 in. thick, cork being packed in between the



ELECTRIC ICE TRUCK FOR HOT CLIMATES

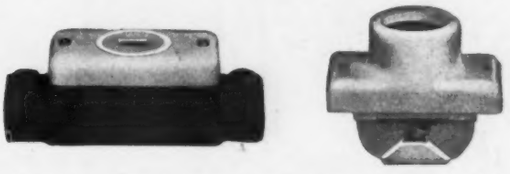
panels. To withstand the heat from the ground the floor is made 4.5 in. thick and is built in layers. From top to bottom these layers consist of 1 in. of oak planks, 1.75 in. of asphalt composition, 1 in. of cork boards and 0.75 in. of pine boards. The rear doors of the truck are of the refrigerator type. Trap outlets are provided in the bottom of the body to let water out without admitting air. Inside the body are adjustable cross-bars used to hold the ice fast while the truck is moving. The rear step is of the folding type, and when it is folded up no one can ride on the rear. This truck was built by the Baker Motor Vehicle Company, Cleveland, Ohio, for the Porto Rico Ice Company, Porto Rico.

Cast-Iron Switchbox

A cast-iron switchbox, which is designed so that it can be placed in a 2-in. partition or a sliding-door casing, is being made by the Bauer Switch Box Manufacturing Company, Cleveland, Ohio. The box is provided with long ears so that the screws can get a good "bite." In the illustration is shown a method of installing the box at a uniform distance from a door casing. A short 2-in. by 4-in. beam is nailed to the door buck, to which the box is fastened by two wood screws. A third screw is fastened to a cross-piece as shown.

Receptacles for Pipe Taplets

The plug receptacle for pipe taplets shown in Fig. 1 and the lamp receptacle for pipe taplets in Fig. 2 require no tap wires. The main wires are bared for half

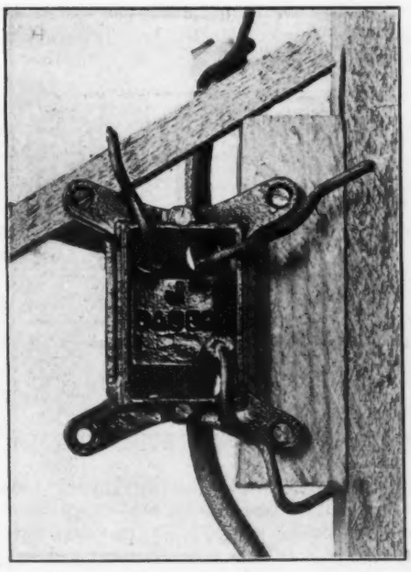


FIGS. 1 AND 2—PLUG AND LAMP RECEPTACLE

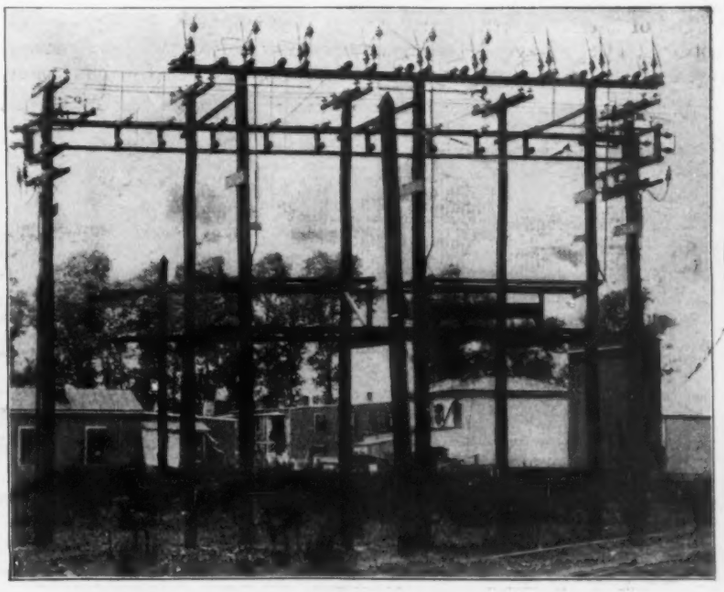
an inch and fastened directly to the binding screws of the fittings. There is also room under the base for a third wire. The same type of base is used for both devices, and the caps, therefore, can be interchanged without taking the base from the taplet. For waterproof work a rubber gasket is used for the screw-shell receptacle. These receptacles are being made by the H. T. Paiste Company, Philadelphia, Pa., for which the Hart & Hegeman Manufacturing Company, Hartford, Conn., is sole selling agent.

Air-Break Switching Station

In the accompanying illustration is shown a 13,200-volt installation of pole-top switches consisting of three three-phase switches designed to open loaded circuits and twenty-one single-pole weather-proof disconnecting switches. The equipment controls three lines feeding two underground circuits and one overhead system. The station is built on nine 40-ft. poles and gives sufficient space, it is declared, for the necessary pot-heads, arresters and busbars. The switching equipment for this installation was manufactured by the Delta-Star Electric Company, Chicago, Ill.



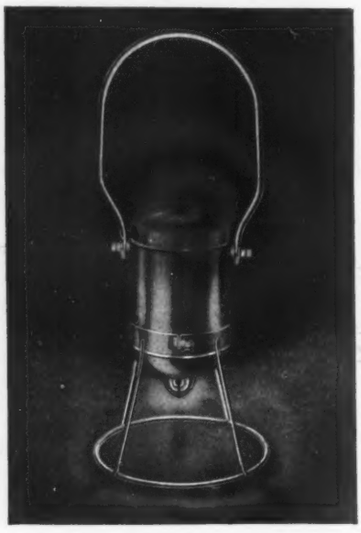
METHOD OF INSTALLING SWITCHBOX



WEATHERPROOF AIR-BREAK SWITCHING STATION

Electric Lantern

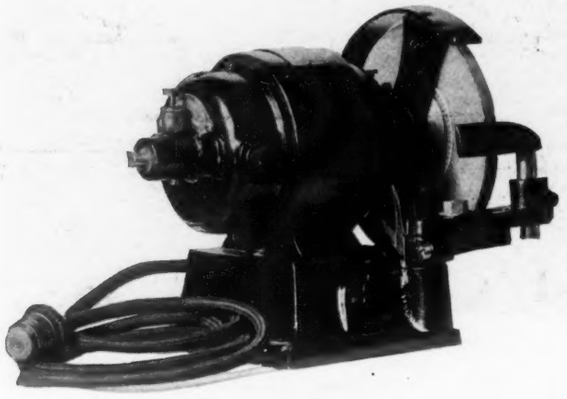
An electric lantern with its lamp below a cylinder, in which a dry-cell battery is placed, is shown in the accompanying illustration. The lamp is protected by a wire guard on which the lantern may stand. The cylinder containing the battery is 3.125 in. in diameter. This lantern is being placed on the market by the Federal Sign System (Electric), Chicago, Ill.



ELECTRIC LANTERN RESTING ON LAMP GUARD

Electric Grinder

A grinder which is operated by a 0.25-hp direct-current motor is being manufactured by the Atwater Electric Works, Coopersville, N. Y. The grinding wheel is 6 in. in diameter and is connected directly to the shaft of the motor. The wheel is protected by a strong guard, and an adjustable rest is provided for grinding the work. The shaft is of chrome-nickel steel and runs in long phosphor-bronze bearings. The brushes of the motor can be removed from the outside without disturbing any of the other parts. Rectangular carbon brushes of the cartridge type are used. The motor is dust-proof, and each bearing is equipped with felt packing rings which are kept tight by threaded brass collars. The field coils are wound with enamel wire and the armature with combination enamel and silk wire. The commutator has twenty-four parts, which are built up on threaded steel bushings. A snap switch is concealed in the base.



MOTOR-DRIVEN GRINDER

Small Ventilators

Ventilators of the fan and blower types are shown in the accompanying illustrations. The fan in Fig. 1 is designed to throw the air directly to the front instead of spreading it out. For this purpose the ends of the blades are abruptly turned up. The motor is inclosed. The blower shown in Fig. 2 is designed for use with systems of piping or where some resistance is offered to the passage of the air. The essential parts of this blower are the motor, the Sirocco blower wheel mounted on the motor shaft, a cast-iron housing to direct the air current, and a supporting base. The blower housing can be revolved and reversed so as to direct the discharge horizontally to either side or vertically up or down. The fans and blowers on these outfits are being manufactured by the American Blower Company, Detroit, Mich., and they are operated by Westinghouse motors.

FIG. 1—VENTILATING FAN

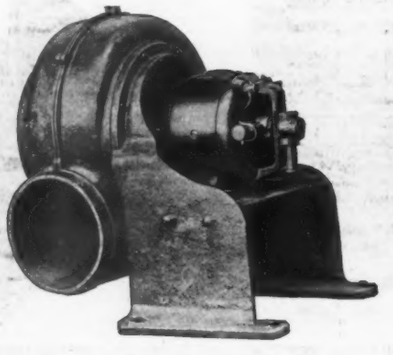
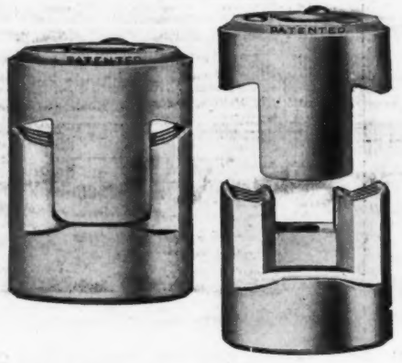


FIG. 2—ELECTRIC BLOWER

Reversible Split Knot

The round reversible split knob shown in the accompanying illustrations is provided with two wire grooves. The two pieces interlock and can therefore be kept in place while being installed. The knob can be put in place with either screws or nails. The wire way is triangular in construction and grips the wire, the manufacturers declare, without causing injury to the insulation.

This "Buckeye" knob, as it is called, is being manufactured by the Findlay Electric Porcelain Company, Findlay, Ohio.



REVERSIBLE SPLIT KNOB

Electric Brewery Trucks

The electric "keg-roll" truck shown in Fig. 1 is equipped with a body made of steel I-beams, the I-beams being padded with oval iron which is said to lessen the wear on the wooden kegs. The back is

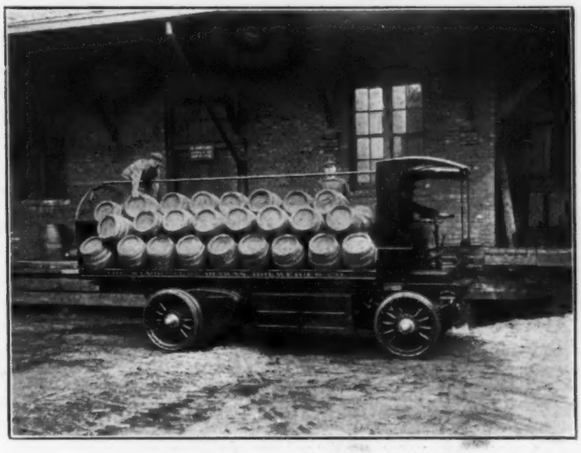


FIG. 1—ELECTRIC KEG-ROLL TRUCK

equipped with a sign panel of the German type. This truck is of 4 tons capacity and has a loading space 15 ft. 6 in. long and 62 in. wide. The truck is designed to carry forty full half-kegs and fifty-nine empty half-kegs. The body is so constructed that it will carry eighth-size, quarter-size, half-size and full-size barrels. The driver's seat is equipped with storm front and side curtains.

In Fig. 2 is shown a 4-ton electric truck designed to carry 100 thirty-six-bottle cases (bottles filled) or 150 twenty-four-bottle cases (bottles filled). The length of the loading space is 15 ft. and the width is 63 in. In this truck the side-door stakes and the end stakes are removable. A driver leaving the brewery with a complete load of full cases starts unloading from either side, and as he picks up empty cases he loads them into the truck from the front to the rear, working continually farther back into the truck. Toward the end of the trip he is working from the rear door

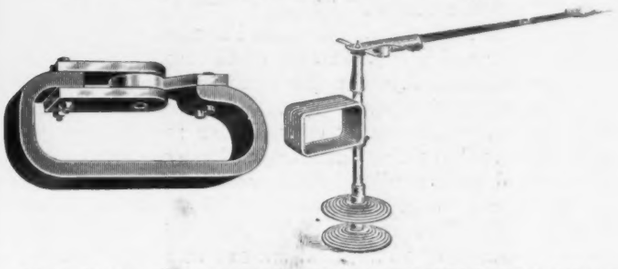
FIG. 2—ELECTRIC BREWERY TRUCK FOR CARRYING BOTTLE CASES

instead of the side doors, and has completely unloaded and reloaded the truck without having been obliged to shift the cases.

These trucks were built by the Baker Motor Vehicle Company, Cleveland, Ohio.

Direct-Current Meters with Long Scales

Direct-current meters of the moving-coil and permanent-magnet type, with angular deflections of 300 deg. or more, are being made by the Record Electrical Company, Ltd., Caxton House, Westminster, S. W., London, England. The permanent magnet is in the shape of an elongated *C* as shown in Fig. 1. To one pole of this magnet is bolted a ring-shaped extension, around which the movable coil swings, the movement being limited only by the supporting neck of the pole. This pole is interleaved between polar cheeks fixed to the opposite extremity of the magnet, leaving an air-gap on both

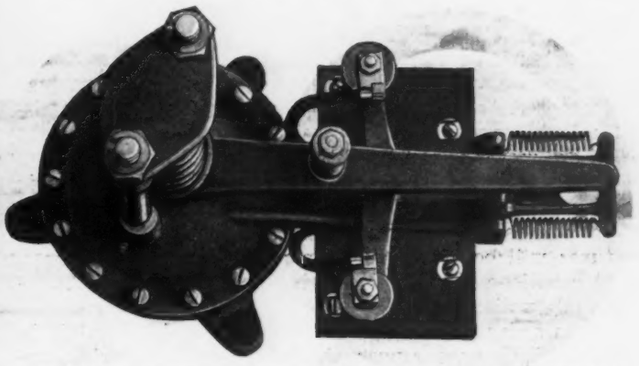


FIGS. 1 AND 2—PERMANENT MAGNET WITH POLE PIECES AND MOVING COIL

sides with a free movement of the coil. The whole moving system is very light. The coil is shown in Fig. 2. The weight of the pointer balances the coil in the larger instruments; in the smaller ones a slight extra weight is added. The large angle through which the pointer swings permits the use of a large scale, which in many respects is advantageous.

Automatic Pressure Regulator for Controlling Small Motors

The double-pole, diaphragm-type pressure regulator illustrated herewith is designed for automatically controlling small direct-current or alternating-current motors operating on pressure systems. This regulator stops the motor when the maximum pressure desired is reached and starts it again when the pressure drops to the low value for which it is set. For direct-current motors with ratings up to 1 hp and alternating-current motors with ratings up to 5 hp this regulator controls the motor without an additional magnetic switch and



AUTOMATIC PRESSURE REGULATOR DESIGNED TO CONTROL SMALL MOTORS

automatically maintains pressure in the systems between given limits.

The device described above is being manufactured by the Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Jobber, Dealer and Contractor

Co-operation Between Electrical Contractors and Jobbers

To promote co-operation among the branches of the electrical industry on the Pacific Coast a joint committee of jobbers and contractors of the California Association of Electrical Contractors and Dealers has issued an interesting statement of the principles for which it stands, outlining also the line of work which it proposes to follow in order to educate the industry and its members for greater responsibilities.

"It is fully recognized," declares the committee, "that the economic and proper channel of distribution of electrical supplies is through the electrical-supply jobber to the dealer and contractor, who, in turn, serves the consumer. By this method the dealer and contractor is enabled to have the advantage of a complete stock of electrical merchandise in the warehouse of the jobber which can be drawn on at any time, whether one item or a hundred are needed. Thus the dealer can also be assured of prompt shipments and satisfactory service.

"The jobber makes it his business to keep in close personal contact with the dealer and contractor in his territory, studies his wants and plans to serve his needs, whatever they may be. Through frequent calls of his salesmen he is often enabled to give valuable information. He also keeps himself advised of the new lines of standard goods on the market and furnishes technical data or gives such other information as may be useful from time to time.

"He is frequently able to be of service by 'carrying' a contractor or dealer who has been tied up financially on account of delays in jobs over which he has had no control.

"The dealer and contractor is the natural channel for distributing electrical devices to the consuming public. He carries the material in stock and displays it on his counters and in his show windows. The consumer is thus enabled to see the material which he is purchasing, and knows that he is getting full value for his money."

The object of the joint committee, as set forth by itself, is to promote the use of electrical appliances and to influence the public to adopt the idea: "Do it electrically." Its statement continues:

"The co-operation of the central station in each district is highly desirable, and a closer relationship with the architect and those engaged in the industry must be recommended. In the past the industry has failed to provide suitable showrooms at which the consumer can obtain electrical appliances, therefore the committee will encourage the establishing of proper stores where material can be obtained at retail.

"To accomplish this end a campaign of education is about to be instituted. It provides for visits by the committee to all parts of the State, where public lectures will be given, supplemented by moving pictures, stereopticon views and working demonstrations of electrical appliances.

"In order to gain the full confidence of the public in the industry we represent, the class of material furnished and the excellence of workmanship in its installations must be of the highest order.

"We recognize that in our business, probably more than in any other, the public is woefully ignorant of the quality and merits of devices. Whether or not customers are satisfied depends upon how we serve them. We should recognize that the National Electrical Code, while it has accomplished great good, does not to the fullest extent accomplish the desired results for the reason that it does not distinguish between standards of material. We will advocate the grading of material by the National Fire Protection Association.

"We recognize that local inspection bureaus are not responsible for installations in compliance with architects' specifications. We will advocate the employment of one or more competent electrical engineers, whose duty it will be to furnish architects with certificates, certifying that work has been performed in accordance with the specifications embodied in the contract."

The Electrical Contractor as a Business Man

In his recent address to the members of the Louisville (Ky.) Electrical Clearing House Association, which includes all of the fifty or sixty electrical contracting concerns in the city, Mr. Frank A. Good, electrical engineer for F. A. Clegg & Company, sought to give reasons why 88 per cent of the men who enter the electrical-contracting business fail, and outlined means by which the average contractor could reasonably insure success in business.

The reasons why contractors fail, according to Mr. Good, are: Because of lack of business training; inability to estimate accurately costs on work undertaken; unfair competition; catering to general contractors, and failure to add the overhead costs to their estimates.

The ranks of the contractors are recruited from the ranks of the wiremen, Mr. Good pointed out, and though these men feel confident that they are particularly well equipped to succeed at the contracting business they fail because they pay most attention to the practical side and too little to the commercial. It is along the latter line that they should school themselves.

Their systems of estimating and cost accounting are often faulty, and they not only fail to keep a general labor record but neglect to retain detailed records of previous jobs to guide them on others. Almost never, of course, are the labor items carried out to the unit basis. Such contractors need to post themselves on estimating and record-keeping methods.

Concerning the contractor who indulges in unfair competition, not only does this man eventually put himself out of business, but while he does last and while he does take work "at any old price," he is discrediting and taking bread out of the mouths of his fellows who are trying to conduct their businesses on a safe and legitimate basis.

It is the fault both of the general contractor and the electrical sub-contractor that the matter of catering to the general contractors has come to be the evil it is at present, Mr. Good declared. In the first place the sub-contractors should not allow themselves to be used by the general contractor but should make one price and stick to it. There are many general contractors who would and do play fair, but they are often besieged by sub-contractors who intimate that if they knew what other bids were being made they could probably make better prices.

In concluding, Mr. Good dwelt at length on the failure of electrical contractors to add in the "overhead" to their estimates on jobs. Many of them "get by," he said, by adding a gross profit to their estimates, which is sufficient to mean a net profit for themselves, but, since the overhead charge differs widely on almost every job, no general average for the gross profit is safe. It is this feature on which most of the electrical contractors who fail "fall down" very heavily. The study of "overhead" should be undertaken by every contractor who is not already versed along those lines.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Orders for Small Motors.—The Bell Electric Motor Company, Garwood, N. J., is reported to be receiving a number of orders for small motors. The business of this company, taken as a whole, is said to be good, although at present there is no demand for large units.

New Building for Wire Company.—The Detroit Insulated Wire Company, Detroit, Mich., is erecting a new building of steel construction, covering a space 57 ft. by 138 ft., and a smaller building, covering a space 35 ft. by 50 ft. These buildings will provide for new machinery to be added to the company's equipment.

Electric Manufacturer in New Field.—The Trumbull Electric Maufacturing Company, Plainville, N. J., is now making armored cable, flexible conduit and armored flexible cord. The company recently purchased the machinery and patent rights from a former manufacturer and is now turning out the above products in its own factory.

Salesmen's Annual Meeting.—Thirty salesmen of the F. Bissell Company met at the home office in Toledo, Ohio, in annual session on Wednesday of last week. On the following day they went to Cedar Point and then proceeded to Cleveland, where Friday, Saturday and Monday were spent at Nela Park. The business sessions took place at the latter place, where the men lived in tents.

No Shortage in Permanent Magnets.—In spite of the fact that the European war has eliminated several foreign sources of permanent magnets required in the electrical industry, no dearth in the American supply is as yet apparent. The Esterline Company, Indianapolis, Ind., is reported to be holding its own in this respect, and is prepared to furnish on short notice permanent magnets of various types.

Motion-Picture Supplies from Paris.—Mr. W. B. Cook, manager of the Pathéscope Company, Æolian Hall, New York, states that shipments from the Paris factory are being received in spite of the war, and that the company will be able to take care of all orders. Although the plant in Paris has been operating with a reduced force, it is expected that the full complement of employees will soon be again working.

Insulator Pins via the Panama Canal.—Mr. J. A. Navarre, Toledo, Ohio, dealer in locust insulator pins, lately shipped a carload of pins to San Francisco, Cal., from his mill in Pennsylvania via New York and the Panama Canal. The shipment made up part of the cargo of the steamship *Missourian* of the American-Hawaiian line, which passed through the canal on Aug. 15, being the first trading ship to make the trip.

American Glassware Production Increased Because of Foreign Unrest.—The European war has tended to decrease foreign competition in glassware for lighting fixtures. The Holophane Works of the General Electric Company, Cleveland, Ohio, are said to have noted an increase in business as a result. This concern is putting out a new type of tinted glassware which diffuses the rays so that the light approximates a daylight value.

Importer's Supply of Carbon Cut Off.—Hugo Reisinger, 11 Broadway, New York, importer of carbon, is said to be receiving no carbon from abroad at present. This concern gets its supply chiefly from Nurnberg, Germany. Before the war in Europe began the amount of carbon on hand was smaller than usual on account of the generally poor business conditions throughout the summer. This supply was soon exhausted after hostilities commenced.

Motor-Driven Pumps for Saskatoon, Sask.—The City Council of Saskatoon at its meeting of June 29 accepted the tender of Messrs. Escher, Wyss & Company, of Montreal, Quebec, for a turbine-driven centrifugal boiler-feed pump. The same company was also awarded a contract for one 4,000,000-gal. motor-driven centrifugal pump to operate against a head of 162 ft. and one 4,000,000-gal. motor-driven centrifugal pump to operate against a head of 40 ft. The motors and switchgear are of the Canadian General Electric Company's manufacture.

Business in Lamps Good.—The Laco-Philips Company, 131 Hudson Street, New York, continues to receive shipments weekly from its plant in Eindhoven, Holland, and its business in the United States is said to be very good. Since the majority of the employees in the plant in Holland are women, the company is not short of help because of the war conditions throughout Europe. The company's plant in Vienna, Austria, has been closed, but the establishment in Holland will be able, it is claimed, to take care of all orders for some time to come.

Rapidly Decreasing Supplies Curtail Output.—The H. W. Johns-Manville Company, New York, is reported to be meeting with considerable difficulty in manufacturing certain of its products on account of the shortage of supplies from foreign countries. Among these are cork from Spain and salammoniac from England. A certain amount of salammoniac can be obtained in this country but it is usually of an inferior quality. This company is also having a hard time obtaining suitable quantities of rubber. A large number of orders are being received, although the tendency is toward small amounts.

No Outlet for German Machinery.—The Wiener Machinery Company, sole agent in the United States for Heinrich Lanz, manufacturer of locomobiles, is receiving no equipment from abroad. Prior to the European war the business of this company was booming. Many orders now remain unfilled. The Wiener company, however, is evincing considerable optimism, and as soon as the war ceases the business, it is declared, will again be thriving. It is said that the number of employees in the Lanz factory has been reduced to one-third of what it usually is, the majority of the other two-thirds being at the front.

German Electrical Plant Becomes a Hospital.—It is reported that the plant of Koerting & Mathiesen, Leipsic, Germany, has been made over into a temporary hospital. The motor factory at Aix la Chapelle, which place formed a base for the German armies in their operations against Belgium, has been burned, and a large stock was destroyed. The Kandem Electric Company, 49 East Twenty-first Street, New York, agent for the above company, has received no shipments from Germany for some time. The amount of stock on hand now is practically exhausted, and the company will perforce have to rest on its oars until the great European conflict is ended.

Louisville Fixture Company Changes Name.—When the merger of Louisville (Ky.) utilities resulted in the organization of the Louisville Gas & Electric Company, confusion was caused by the similarity of the new name with that of the Louisville Gas & Electric Fixture Company, which had been doing business in Louisville for several years. As telephone users were, for example, regularly getting the wrong party, the fixture company in the interest of harmony and identity decided to amend its charter and to change its name to the Louisville Wiring & Fixture Company. Since this title describes the activities of the company better than did the old name—for, according to Mr. Thomas O'Leary, secretary of the company, "there is no gas-fixture business in Louisville any more"—the company feels that the change of firm style is a decided advantage.

War Boosts Ball-Bearing Industry.—Prior to the great conflict now raging in Europe a large number of the ball

bearings used in this country were manufactured in Germany. After hostilities broke out, however, manufacturers made haste to increase their facilities in the United States. One of the concerns initiating this movement is the Norma Company of America, 1790 Broadway, New York, which is enlarging its American plant. Shipments have not been received from its establishment in Stuttgart, Germany, for a month, although word has been received both by letter and cable that the factory is working and that shipments will be made via Rotterdam, Holland. This company was fortunate to have a supply of some 500,000 ball bearings when the war began, and with this supply added to the output of the American plant all orders have been easily taken care of. The ball-bearing industry generally seems to be healthy and to be improving in spite of unsettled conditions.

The Mica Situation.—Mr. J. Meirowsky, of Meirowsky Brothers, 106 Broadway, Jersey City, N. J., declares that, although it is too early to say what the definite effect of the European war will be on the mica market, there are some results that can be clearly seen at the present time. It is rumored, he states, that certain mines in India will be closed for some months to come, and it is even reported that all mines in India will be ordered shut down by the English government because of the large amounts of explosives used. In addition to the curtailment of production, the shipping facilities have also been affected, and so it is natural to expect a rise in prices. On the other hand, Mr. Meirowsky remarks, the consumption of mica has also been reduced. To Germany, Austria and France, where large amounts of mica are used for manufacturing purposes, shipments have practically ceased. The conclusion seems to be that there may be an advance in prices, especially on block mica. Mr. Meirowsky has also heard that mica has been declared contraband of war by England.

A Large Electric Company's Welfare Work.—The General Electric Company provides a 25-cent table d'hôte dinner for its employees at its Schenectady plant. Food supplies are obtained from a farm adjoining the plant, which is owned and operated by the company. In addition to the table d'hôte dinners, which are served only during the noon hour, à la carte service is provided during the rest of the working day. The shop restaurant is an attractive two-story concrete building designed especially for restaurant purposes. The building has two large dining rooms, each with a seating capacity of 450, and another large dining room for the use of foremen and other supervisory help. It is equipped with every modern convenience for the cooking and refrigeration of foodstuffs. All food is prepared in the building. In addition there are also lunch counters in several of the largest buildings where women are employed. Tea, coffee and milk are served at the counters, with light lunches obtained from the main restaurant. The large office building, eight stories high, also has its restaurant. The company employs a welfare secretary. Interest in the fostering of athletics, the education of foreign employees and the beautifying of workmen's surroundings are among the evidences of the company's care for its working force.

NEW YORK METAL MARKET PRICES

	Sept. 1		Sept. 8	
Copper	Bid	Asked	Bid	Asked
Standard spot*	.....	.....	.....	.....
	Selling Prices		Selling Prices	
London, standard spot*	.....	.....	.....	.....
Prime Lake	12.50 to 12.75†		12.50 to 12.75†	
Electrolytic	12.25 to 12.35†		12.20 to 12.30†	
Casting	12.15 to 12.25†		12.15 to 12.25†	
Copper wire base	13.75 to 14.00		13.75 to 14.00	
Lead	3.90		3.90	
Nickel	40.00 to 45.00		40.00 to 45.00	
Sheet zinc, f.o.b. smelter	8.50		8.50	
Spelter, spot	6.00 to 6.10		..... to 5.85	
Aluminum	19.50 to 20.50		19.50 to 20.50	

*COPPER EXPORTS

Total tons to Sept. 8	4,785

*From daily transactions on the New York Metal Exchange.

†Nominal.

NOTE.—The New York Metal Exchange and the London Metal Exchange have been closed until further notice. No reliable quotations on old metals can be obtained for the present. There is no buying in this market.

Corporate and Financial

Receivership for Seven Cities Company.—The Southern Trust Company, of Little Rock, Ark., has been appointed temporary receiver for the Seven Cities Company, Russellville, Ark., on application of the Russellville Water & Light Company.

Mexico Electric Company.—Mr. Simon B. Storer, president and treasurer of the Mexico Electric Company, Mexico, N. Y., and his associates expect to take all of the securities recently authorized to be sold at par by the Public Service Commission of the Second District of New York. The securities are $41,000 first-mortgage 6 per cent bonds and $20,000 capital stock.

To Pay Interest on Notes.—The Kansas City (Mo.) Railway & Light Company announces to holders of certificates of deposit representing the 6 per cent notes due on Sept. 1, 1912, that it has arranged for the payment on Sept. 1, 1914, at the New York Trust Company, New York, of interest on notes from March 1, 1914, to Sept. 1, 1914, at the rate of 7 per cent per annum.

Public Service Properties.—The firm of W. S. Barstow & Company, of New York, has issued a thirty-five-page booklet in leather giving general data regarding public utility companies under its management, with yearly gross earnings in excess of $4,000,000. The bookle tcontains the capitalization of each company, and in the case of railroad companies maps are also shown.

Idaho-Oregon Sale.—In holding that the $718,000 first and refunding mortgage bonds, ownership of which is claimed by the Idaho Railway, Light & Power Company, were obtained without consideration, as stated by the Priest committee, Judge Dietrich cleared the way for the stockholders to bid in the property of the Idaho-Oregon Light & Power Company, Boise, Idaho, according to Receiver W. J. Ferris.

Additional Virginia Railway & Power Company Bonds Listed.—The New York Stock Exchange has granted the application of the Virginia Railway & Power Company of Richmond, Va., to list $200,000 additional face value of its first and refunding mortgage 5 per cent bonds and also to list an additional $550,000 of the bonds upon official notice that they have been sold and passed beyond the control of the company. This makes the total amount applied for $12,253,000.

Commonwealth Earnings.—The Commonwealth Power Railway & Light Company, Jackson, Mich., in its condensed earnings statement for the twelve months ended June 30, 1914, showed gross earnings of $2,981,684, made up of $2,463,861 as earnings on stocks owned by the company in subsidiary companies and $517,823 as miscellaneous earnings. Expenses and taxes amounted to $114,508, and interest charges of $659,842 swelled the total deductions to $774,350, thus leaving $2,207,334 as net income available for dividends, replacements and depreciation. Deducting $960,000 for dividends on preferred stock left a balance of $1,247,334.

United Light & Railway Company's Consolidated Earnings.—The consolidated earnings sheet of the subsidiary companies of the United Light & Railways Company of Grand Rapids, Mich., shows gross earnings of $1,491,355, an increase of $170,103 over 1913. Expenses and taxes amounted to $97,384, an increase of $17,454 over 1913, thus leaving $1,393,971 for net earnings, or an increase over 1913 of $152,651. Deducting interest charges of $401,598 and dividends of $627,932 leaves a balance of $464,441, which is an increase of $13,768 over 1913. This balance is exclusive of $34,484 suspended earnings pending rate adjustment, now in progress.

Northern Idaho & Montana Power Company.—The annual report of the Northern Idaho & Montana Power Company, Sandpoint, Idaho, for the year ended Dec. 31, 1913, shows gross earnings of $668,035. From this is deducted $383,380 for operating expenses, leaving $284,655 as net earnings. Other income amounted to $8,426, making gross income $293,081. Bond interest amounted to $317,581 and general interest amounted to $38,265, thus leaving a deficit of $62,765. During the year, Mr. H. M. Byllesby, the president, stated, the net floating debt was reduced by $550,399,

thus saving interest charges to the amount of approximately $33,000 per annum. Had this been effective during the whole twelve months the deficit would have been but $41,850.

New Bond Issue for an American Company in Havana.—The Havana Electric Railway, Light & Power Company, which is a corporation formed about a year ago by the fusion of the Havana Electric Railway Company and the Cia de Gas y Electricidad de la Habana, both American corporations, has arranged for a new issue of $25 000 000 5 per cent bonds for the purposes of refunding the outstanding bonds of the two constituent companies, amounting to approximately $18,000,000, and of providing capital for improvements.

Dividend Period Changed.—The Elmira (N. Y.) Water, Light & Railroad Company will declare a quarterly dividend of 1¼ per cent, payable on Oct. 1, on the $1,000,000 5 per cent cumulative second preferred stock as a result of the dividend period having been changed from semi-annual to quarterly. On July 1, 1 2-3 per cent was paid, covering four months. From September, 1907, to March, 1904, 2½ per cent was disbursed semi-annually. The last payment, 1 per cent on the $1,000,000 common stock, was made December, 1913, distributions having been 1 per cent in October, 1910, and 4 per cent in 1911, 1912 and 1913.

American Public Utilities Company Elects Officers.—At the annual meeting of the American Public Utilities Company held in Grand Rapids, Mich., on Aug. 25, officers were elected as follows: President, Mr. Joseph S. Hart; secretary, Mr. Blaine Gavett; assistant secretary-treasurer, Mr. Willis J. Ripley. Mr. Charles B. Kelsey was elected chairman of the board of directors. The remainder of the board is as follows: Messrs. John H. Blodgett, Boston; C. A. Boalt, St. Paul, Minn.; Joseph H. Brewer and Blaine Gavett, Grand Rapids; Hugh H. Harrison, Indianapolis; Joseph S. Hart, Grand Rapids; E. Clarence Miller and Henry S. Morris, Philadelphia; W. J. Maloney, Wilmington, Del.; Charles McPherson, Grand Rapids; W. B. Parsons, Winona, Minn.; George T. Whitworth and W. J. Ripley, Grand Rapids.

Iowa-Nebraska Public Service Company Changes Hands.—Upon the completion of the reorganization plans of the Iowa-Nebraska Public Service Company, Norfolk, Neb., which has been in the receiver's hands since May 31, 1913, the properties formerly operated by this company passed into the control of the Continental Gas & Electric Corporation, of Cleveland, Ohio. The reorganization as carried out was the incorporation of the Nebraska Gas & Electric Company and the Iowa Gas & Electric Company, these companies taking over the Iowa-Nebraska company's interests in the respective states. These two companies were then separately sold to the Continental company. Funds for the reorganization were raised by the Continental Gas & Electric Corporation's sale of its securities. Besides the purchase price, the sale provided funds for improvements.

Pump Company Receivership.—Receivers have been appointed for the International Steam Pump Company. The action was taken by the court at the request of three creditors, Messrs. William W. Conley, Alexander J. Lindsay, and J. Harris Harding, who brought a friendly suit in equity against the company in order to protect the assets of the company. The receivers named were Messrs. C. Philip Coleman and Grayson M. R. Murphy. Dividends on the preferred stock have not been paid since May, 1913, although from two years after its incorporation in 1899 the company paid regularly 6 per cent dividends. The liabilities of the corporation as set forth in the complaint are $10,839,937, of which $9,542,895 represents bonded indebtedness. The assets have been placed at $52,000,000, but, the complaint states, they are of such a nature that any attempt to liquidate them at this time would result in injury to the creditors. According to a statement sent out in behalf of the directors, the receivership was rendered necessary since the company, although earning more than the interest charges, would not be able to make the interest payment of about $250,000 and the sinking fund payment of $250,000, due Sept. 1, on its $9,347,900 worth of first-lien twenty-year 5 per cent bonds. The company also lacks working capital. Moreover, the company will be unable to meet on Oct. 2 the 7 per cent interest on its $1,150,000 worth of outstanding collateral-trust notes.

Steps Taken Toward Salt Lake City Consolidation.—Permission to consolidate the franchise granted by Salt Lake City to the Merchants' Light & Power Company with the franchise of the Utah Light & Railway Company was requested from Salt Lake City on Sept. 1 by the Utah Power & Light Company, which owns the franchise of the Merchants' company and proposes to buy the property and franchises of the Utah Light & Railway Company, now owned by the Harriman railroad interests. The request was taken under advisement by the City Commission, which has intimated that it will insist on lower rates for energy before granting the request. The Merchants' company franchise was granted on Aug. 22, 1912, and was subsequently assigned to the Utah Power & Light Company, which controls the wholesale business of the region and a considerable portion of the retail field. The petition to Salt Lake City is the first public step toward the change of ownership of the Utah Light & Railway Company, which had been rumored for some time. Mr. P. B. Sawyer, general manager of the Utah Power & Light Company, has issued the following statement: "Interests connected with the Utah Power & Light Company propose to acquire the property, rights and privileges of the Utah Light & Railway Company. The acquisition of the property and rights of the Utah Light & Railway Company is not completed, but is still more or less tentative. The Utah Power & Light Company is now the owner of a light and power franchise from Salt Lake City, one of the terms of which is that the grantee shall procure the consent of the commission to any consolidation, either direct or indirect, of the business and properties of the grantee with that of any other company in Salt Lake City. The franchise itself is a very advantageous one to the city, inasmuch as the right of regulation is reserved by the city. Many advantages to Salt Lake City and its inhabitants will result from an economical management and control of the properties."

Financing of the Coon Rapids Development.—A bond circular recently issued by H. M. Byllesby & Company gives an interesting account of the financing of the Northern Mississippi River Power Company, which owns the new Coon Rapids hydroelectric plant on the Mississippi River 11 miles above Minneapolis. It is announced that the Minneapolis General Electric Company has leased for a period of forty-eight years the property of the Northern Mississippi company. Under the lease the Minneapolis company agrees to operate the plant to its full rated output, pay all operating expenses and taxes, make necessary repairs and replacements, maintain the plant in good condition, and at the termination of the lease to deliver the plant in as good condition and repair as when received, reasonable wear excepted. The lease may not be modified in any way, except with the consent of the trustee, and then only when the Minneapolis company shall have assumed the payment of the principal and interest of the Northern Mississippi River Power Company's first-mortgage 5 per cent bonds. The Minneapolis company is to pay as rental 7 mills for every kilowatt-hour of electricity generated, but a minimum rental is provided payable in monthly instalments, which shall be $125,000 per annum from 1914 to 1917, $175 000 from 1918 to 1921, $225,000 from 1922 to 1925, $250 000 from 1926 to 1929, $275,000 from 1930 to 1933, and $325,000 from 1934 to the termination of the lease. This minimum rental obligation of the Minneapolis company is sufficient to pay the interest on these bonds as it accrues and the principal of the entire authorized issue at maturity. The capital stock of the Minneapolis company is owned by the Northern States Power Company and is pledged as collateral for $5,000,000 6 per cent notes due June 1, 1917, of the latter company. Upon the payment of these notes the Minneapolis company covenants that it will purchase the property of the Northern Mississippi company and as part of the purchase price will assume the payment of the principal and interest of the Northern Mississippi company bonds. The Minneapolis company further agrees, in order to preserve the equity behind this assumption, that it will not place any additional mortgage on its properties without setting aside $2 500 000 bonds of such issue, to be deposited with the Continental & Commercial Trust Savings Bank of Chicago as trustee of the Northern Mississippi company bonds as additional security therefor.

NEW ENGLAND'S STEADY GROWTH

Returns from Central Stations Operating in This Section for June Show Same Steady Increase as in Previous Months for 1914 Over 1913

The returns as received by the *Electrical World* for June from 67 per cent of the central-station industry of New England show an increase in income derived from sale of energy of $120,000, or 8.3 per cent, and an increased output of over 5,000,000 kw-hr., or 11.1 per cent. These figures cover practically all of the larger towns and cities and a large majority of the smaller towns. They do not, however, cover to any great extent the municipal electric light and power plants, the returns from which have been rather slow in coming in from this section of the country. It will be noticed, by referring to the tables, that the income growth has remained practically the same for April, May and June. In each case there was an increase of somewhat over 8 per cent. Two companies, one in Massachusetts and one in Vermont, showed decreases in energy output. In neither case, however, was the loss large, the entire income loss being less than $1,000 and the output loss being approximately 40,000 kw-hr. Table I gives the gross returns from 60 per cent of the New England industry. These figures are strictly comparable, having been received from the same companies for both May and June. The figures there shown are upheld by additional companies and may be taken as indicative of the strength of the entire industry of the New England States from the percentage standpoint.

Existing Unfavorable Circumstances

The returns as shown in the tables do not tell the whole story. The increases as shown are the results of new contracts for motor load. Former years have shown expansion during the summer season owing to the fact that New England was growing fast as a summer resort. It is a fact that New England had a very poor season this year, weather and poor business combining to keep down the vacation and excursion trade. The street-railway traffic was by no means as heavy as was planned for. The small seaside resorts that ordinarily use much energy for their "dime-catching" devices in many cases had to close down for want of trade.

TABLE I—COMPARATIVE RETURNS FOR MAY AND JUNE, 1913 AND 1914, COVERING 60 PER CENT OF THE CENTRAL-STATION INDUSTRY OF THE NEW ENGLAND STATES

	Gross Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
May	$1,741,141	$1,606,903	8.4	52,418,397	50,573,673	3.7
June	1,504,830	1,390,336	8.2	51,355,018	46,089,852	11.4

This, coupled with the slump in business all over the country in June, helps to give the accompanying statistics a much more favorable aspect than would be apparent at a first glance.

Bearing of Community on Returns

These operating returns show well the commercial and domestic character of New England. From the time of their first tradings with the Indians the sturdy people of these States have been a steady, cautious folk. The manufacturers have been satisfied with established methods and have been slow to scrap their old machinery in favor of machinery of more recent design and greater economy. A trip through Fall River, Mass., Providence and Pawtucket, R. I., or along the Connecticut River, will show the majority of the manufacturers relying on their own power. Little by little the people are realizing the advantages to be derived from central-station energy, and the figures in the accompanying tables are indicative of the extent to which they are changing over. The New England households have been slow to install electricity for lighting purposes. Gas gained a strong foothold which electricity is finding it difficult to overcome. In the outlying communities kerosene lamps are still in vogue. Many of the larger towns are just starting to illuminate their streets to any extent by means of central-station energy. Arc lamps are used only in the more important districts.

Great Industrial Center

This section of the country is one of America's greatest industrial centers. Fall River is America's great cotton manufacturing stronghold; Rhode Island is strong in the manufacture of jewelry; Lowell, Mass., is noted for its large number of different industries of worldwide renown; Massachusetts does an enormous shoe trade; New Haven is a large railroad center; Connecticut has large gun and ammunition factories and is prominent in the silversmith trade; Maine is noted for its pulp mills, canneries and granite quarries; Vermont, while mostly agricultural, mines considerable marble and granite; New Hampshire, long known as the "Granite State," is noted for its manufacture of boots and shoes and cotton goods. In New England all of the more important and many of the less important of this country's industries have taken root and flourished. This section, the first to be settled industrially, became the breeding ground for the nation's business.

TABLE II—RETURNS FOR APRIL, MAY AND JUNE FOR ALL NEW ENGLAND COMPANIES REPORTING TO ELECTRICAL WORLD

	Income Derived from Sale of Energy			Energy Output in Kw-hr.		
	1914	1913	Per Cent Increase	1914	1913	Per Cent Increase
April (52 per cent of industry)	$1,501,773	$1,384,255	8.5	43,386,624	39,181,988	10.8
May (63 per cent of industry)	1,745,160	1,609,234	8.4	52,752,247	50,779,103	3.9
June (67 per cent of industry)	1,560,872	1,442,178	8.3	53,463,013	48,049,756	11.1

Future for the Central Station

With the prevailing conditions the 8 per cent increase as shown above clearly indicates the steady advancement of the central stations in New England. With the large cities of Boston, Worcester, Providence and Portland rapidly expanding and with Fall River using more and more electricity to drive her mills, the central-station business ought in the next few years to become one of New England's foremost industries. With the Grand Trunk Railroad coming down through New England in the near future, industrial conditions of this region ought to advance more rapidly than heretofore. The electric truck has taken a firm root in the New England States and will undoubtedly be more prominent as the farmer starts to do a trucking business on a large scale.

Business Notes

The Electrical Construction Company, Little Rock, Ark., has established a branch contracting and supply store at 217 South Main Street, Hope, Ark.

The Pyrene Manufacturing Company.—Mr. C. L. Allen, formerly automobile sales manager, has been promoted to the position of general sales manager for the Pyrene Manufacturing Company, New York.

Mr. E. W. Philips will sever his connection with the Kandem Electric Company, Inc. (formerly the Koerting & Mathiesen Company), 49 East Twenty-first Street, New York, on Sept. 15. The company is unable to obtain any supplies from its owners and manufacturers at Leipsic, Germany.

New Industrial Companies

The Star Lighting Fixture Company, of Bayonne, N. J., has been incorporated with a capital stock of $30,000 by Joseph Ribak, Hyman Goldberg, of New York, N. Y.; Louis Brawn, of Bayonne, and Jacob Brawn, of Newark, N. J.

The Webster Stevens Electric Company, of Wilmington, Del., has been incorporated with a capital stock of $100,000 to do a general electrical business. The incorporators are M. M. Dugan, L. H. Lefferts and J. D. Frock, of Wilmington, Del.

The United States Electric Generator Company, of Boston, Mass., and Providence, R. I., has been incorporated with a capital stock of $50,000 by John W. Bond, of Providence, R. I.; H. P. Morrissey, of Boston, Mass.; H. M. Spooner, of Cranston, R. I.; Arthur P. Manchester, of Providence, R. I., and John Morrissey, of Providence, R. I.

Trade Publications

Glass Fixtures.—Various types of glass lighting fixtures are listed and illustrated in a booklet issued by Gill & Company, Inc., Philadelphia, Pa.

Thread Protectors.—A protector for conduit-pipe threads is described and illustrated in a folder issued by the Enameled Metals Company, Pittsburgh, Pa.

Direct-Current Meters.—Direct-current portable meters of the D'Arsonval type are the subject of a leaflet issued by Louis M. Pignolet, 78 Cortlandt Street, New York.

Whitewashing Machine.—Sprayers and whitewashing machines are described and illustrated in a catalog issued by the Dayton Manufacturing Company, Dayton, Ohio.

Electric Hot-Water Heater.—An electrically operated hot-water heater is the subject of a booklet issued by the Rathbone Manufacturing Company, Grand Rapids, Mich.

Metal Switch Boxes.—In folders issued by the Bauer Switch Box Manufacturing Company, Cleveland, Ohio, is described a cast-iron switch box equipped with long lugs.

Turn-Down Incandescent Lamp.—A so-called "dim-a-lite" turn-down incandescent lamp is described and illustrated in a leaflet issued by the Wirt Company, Germantown, Philadelphia, Pa.

Small Lighting Outfits.—A gas-engine-driven lighting outfit with a continuous rating of 1200 watts is described and illustrated in a folder published by the Strong Electric Company, Des Moines, Ia.

Wood-Preserving Compound.—In a folder issued by the C-A-Wood-Preserver Company, St. Louis, Mo., the advantages of the wood-preserving preparations put out by this company are enumerated.

Conduit Boxes and Fittings.—Pamphlet No. 442, published by the Sprague Electric Works of the General Electric Company, New York, contains short descriptions and illustrations of conduit boxes and fittings.

Recording Gages.—In Bulletins No. 82 and No. 88 published by the Industrial Instrument Company, Foxboro, Mass., are described helical-tube, diaphragm-tube and liquid-level gages. Typical charts are also given.

Tungsten-Lamp Fixtures.—Fixtures for nitrogen-filled tungsten lamps with ratings of 250 watts to 1000 watts are described in a leaflet issued by the Harter Manufacturing Company, 1132 West Austin Avenue, Chicago.

Ventilating System.—The method of ventilating the building of the Toledo (Ohio) Factories Company by means of Sirocco blowers is described in Bulletin No. 27, issued by the American Blower Company, Detroit, Mich.

Fixtures for Nitrogen-Filled Incandescent Lamps.—Fixtures designed for use with high-efficiency tungsten lamps are listed and illustrated in a bulletin published by the Benjamin Electric Manufacturing Company, Chicago, Ill.

Instrument Transformers.—Bulletins No. 2001 and No. 1501 issued by the Weston Electrical Instrument Company, Newark, N. J., contain information on current and potential transformers for use with portable and switchboard instruments.

Personal Mention

Mr. M. H. Pengra, formerly superintendent of the Freeport (Ill.) Railway & Light Company, is now in business at Eugene, Ore.

Mr. A. F. Duke has been appointed manager of the Forney (Texas) Ice & Light Company as successor to Mr. J. E. Moore, Jr.

Mr. L. A. Elliott has succeeded Mr. Ernest Carter as manager and superintendent of the municipal electric plant at Martin, Tenn.

Mr. Edward Rafferty has been made manager of the municipal electric plant at Madison, S. D., as successor to Mr. H. C. Grayum.

Mr. Thomas Cook has been appointed superintendent of the Commerce (Tex.) Ice & Power Company as successor to Mr. P. J. Struve.

Mr. Henry L. Elston has been appointed superintendent of the municipal electric plant at Muscoda, Wis., as successor to Mr. J. M. Kaiser.

Mr. William C. Buell has been appointed superintendent of the Millville (N. J.) Electric Light Company as successor to Mr. R. C. Carey.

Mr. J. C. Ross has succeeded Mr. Henry Dodue as chief engineer of the Yarmouth Light & Power Company at Yarmouth, Nova Scotia, Canada.

Mr. J. M. Jetton, formerly vice-president of the Delta Electric & Manufacturing Company, Cooper, Tex., is now president of the organization.

Mr. Robert E. Martin has superseded Mr. L. G. Zeeveld as manager and superintendent of the municipal water and electric plant at Baraga, Mich.

Mr. L. C. Wagner has been appointed superintendent of the American Light & Power Company, St. Charles, Mo., as successor to Mr. H. J. Ward.

Mr. William P. Bishop has been elected treasurer of the Suffolk Light, Heat & Power Company, Southampton, N. Y., as successor to Mr. L. E. Terry.

Mr. C. H. Nandell, manager of the Marshall (Tex.) Electric Company, has been elected president of that company as successor to Mr. E. H. Hatch.

Mr. O. C. Van Cleave, formerly of Paxton, Ill., has been made local manager of the Central Illinois Utilities Company's property at Saybrook, Ill.

Mr. Henry D. Shute, who has been elected treasurer of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., as successor to Mr. T. W. Siemon, was formerly acting vice-president of that organization. Mr. Shute entered the Westinghouse works in 1893 as an apprentice and has been connected with the company from that time until the present. He spent a couple of years in the testing department, after which he was engaged in erection and laboratory work. In 1897 he entered the engineering department and one year later was transferred to the commercial department, where in 1901 he was placed in charge of the alternating-current division. Two years later he was promoted to be assistant to Vice-president L. A. Osborne, in which position he was particularly active in the development of heavy-duty electric traction and single-phase railway work. In 1910 Mr. Shute succeeded Mr. Walter McFarland as acting vice-president, holding this position until his present appointment. Mr. Shute was educated at the Massachusetts Institute of Technology and at the School of Mines, Dresden, Germany. He is an associate member of the American Institute of Electrical Engineers and a member of the Engineers' Club, New York City. He is a director of the Pittsburgh Chamber of Commerce.

HENRY D. SHUTE

Mr. M. C. Hunter, secretary and treasurer of the Edina (Mo.) Light Company, has been made manager of the company, succeeding Mr. Harry N. Leist.

Mr. L. E. Greilick has superseded Mr. Charles Wilhelm as vice-president of the Boardman River Electric Light & Power Company, Traverse City, Mich.

Mr. Joseph Bouchard has been appointed superintendent of Willetts, Ltd., the electric plant at Chambly Canton, Quebec, as successor to Mr. Brock Willett.

Mr. C. R. Fitz, who has resigned as vice-president of the Suffolk Light, Heat & Power Company, Southampton, N. Y., is still a member of the board of directors.

Mr. N. H. Johnson, formerly superintendent of the municipal electric plant at Richmond, Ind., is now manager of the Richmond (Ind.) Light, Heat & Power Company.

Mr. L. M. Macy is president and manager of the new Adel (Iowa) Light & Power Company, which formerly did business under the name of the Adel Milling Company.

Mr. Burr Gran has succeeded Mr. John Simpson as local superintendent of the electric-service system at New Boston, Ill., a Tri-County Light & Power Company property.

Mr. R. D. S. Beckstedt has been appointed superintendent of the Tagona Water & Light Company, Sault Ste. Marie, Ontario, Canada, as successor to Mr. R. A. Campbell.

Mr. M. V. Bostain has been made general manager of the Carlisle (Ky.) Electric Light & Power Company, succeeding Mr. Boon Ingels, who held the position for many years.

Mr. Luther Stover has been appointed manager of the Williams (Ariz.) Water & Electric Company, successor to the Grand Canyon Electric Light & Power Company.

Mr. Theodore Rice has been appointed business manager of the Northern Power Company, Potsdam, N. Y., to assist Mr. A. A. Potter, who is local manager of the company.

Mr. Tom Graham has been appointed district manager of the Arlington Electric Company, Clarendon, Va., which is controlled by the Alexandria (Va.) County Lighting Company.

Mr. George L. Howard has resigned as district manager of the San Joaquin Light & Power Corporation at San Luis Obispo, Cal., where he has been succeeded by Mr. Fletcher Easton.

Mr. Charles Walsh, who has been appointed secretary of the Springfield (Ill.) Gas & Electric Company, was formerly assistant to the general auditor of Hodenpyl, Hardy & Company, New York.

Mr. Alfred Montgomery has tendered his resignation as manager of the Leominster (Mass.) Electric Light & Power Company to take effect Oct. 1. Mr. Montgomery intends sailing for London in October to rejoin his mother, who is seriously ill.

Mr. F. W. Harvey, Jr., formerly business manager of *Popular Electricity,* is now assistant manager of the Electrical Trades Exposition Company, the organization which will manage the electrical show to be held at Chicago during the fall.

Mr. David R. Thomas, who since April 1 of this year has been general manager of the Michigan Power Company, Lansing, Mich., was formerly treasurer and general manager of the Port Jervis Light & Power Company and the Orange Power Company, operating within a radius of 20 miles of Port Jervis, N. Y.

Mr. George B. Tripp, vice-president and general manager of the Harrisburg (Pa.) Light & Power Company, has become operating executive of the United Gas & Electric Company, New York City. He still acts as vice-president of the Harrisburg company, but has been succeeded by Mr. C. M. Kaltwasser as general manager.

Mr. C. F. Beames, having completed his three years' engagement as chief electrical engineer to the government of the Maharajah of Mysore, India, during which time he had under his charge the operation of the Cauvery system, the largest long-distance, high-tension network in operation in the Far East, is returning to the United States.

Mr. T. Julian McGill has been appointed district manager of the Chicago office of the Westinghouse Electric & Manufacturing Company, succeeding Mr. T. P. Gaylord. Mr. McGill, who is a Virginian by birth, is no stranger to Chicago, having been a salesman in the Chicago office a number of years ago. Before that Mr. McGill was connected with the old Siemens & Halske Electric Company of America. He left Chicago to become district manager of the Minneapolis office of the Westinghouse Electric & Manufacturing Company, and after that he was made district manager of the Atlanta office of the company, from which position he is about to be transferred to the management of the Chicago office. He is a member of the Jovian Order.

Obituary

Gen. Charles Truman Hotchkiss died in Chicago on Aug. 28, aged eighty-two. In 1848 he helped his father build the first telegraph line out of Chicago, the wires being erected between Milwaukee and Chicago. He became the first operator at the Chicago end of the line. He was an officer in the Civil War.

Robert Johnson McCuen, for nearly fourteen years superintendent of the department of lamps and lighting of the city of Baltimore, Md., died Aug. 31, at the age of fifty-nine. Although he had been ailing since last June, his death was unexpected. Mr. McCuen's aim was to provide Baltimore with the best lighting system possible and at the smallest outlay of money. When he took charge of the department the annual appropriation for lighting the streets was about $450,000. This amount he reduced to $100,000 the first year he was in office. The present lighting system in Baltimore, one of the best in the country, is credited to Mr. McCuen's labors.

Thomas E. Hughes, who had been manager of the Philadelphia office of the Standard Underground Cable Company for the last seventeen years, died at his home in Atlantic City, N. J., on Aug. 27. Prior to his connection with the Standard cable company, Mr. Hughes was with John A. Roebling's Sons Company at Trenton, N. J., and Scranton, Pa., and with the Washburn & Moen Manufacturing Company at Worcester, Mass., and Pittsburgh, Pa. For a number of years he was secretary and director of the Manufacturers' Club, Philadelphia. In the spring of 1913, while about to return from a visit to Bermuda, where he had gone for his health, Mr. Hughes suffered a stroke of paralysis which kept him from resuming his regular duties for nearly a year.

Henry Harbinson Sinclair, pioneer in electric transmission and hydroelectric development in California, whose death at Pasadena, Cal., Aug. 31, was announced in these columns last week, established the first water-power plant on the Pacific Coast at Redlands, Cal., nearly twenty-five years ago. Born in Brooklyn, N. Y., in 1857, Mr. Sinclair went West at the age of twenty-two, and in 1889 purchased an orange grove at Redlands, Cal. Later, in company with three others, he organized the Redlands Electric Light & Power Company, which developed the water-power of mountain streams in the vicinity, being the first development of the kind in the State. After launching this undertaking Mr. Sinclair assisted in organizing the Southern California Edison Company, originally the Edison Electric Company of Los Angeles, and became its vice-president, continuing to serve as such until his death. Several years afterward he acted as consulting expert for the Great Western Power Company of San Francisco, and in 1909 became its vice-president and general manager. In 1911 he left this organization, returning to southern California to give attention to personal interests. Mr. Sinclair was a noted yachtsman, having twice won the ocean race from San Francisco to Honolulu. He was a member of the California Club of Los Angeles and the Valley Hunt Club of Pasadena.

HENRY H. SINCLAIR

Construction

New England

ROCKLAND, MAINE.—The Rockland, Thomaston & Camden St. Ry. Co., of Rockland, has decided to erect a new transmission line to Warren for the purpose of furnishing electricity for lamps.

WEST POWNAL, MAINE.—Bids will be received by the State Board of Hospital Trustees, at the office of Dr. Carl J. Hedin, superintendent Maine School for Feeble-Minded, West Pownal, until Sept. 18, for construction of power plant and transmission line. Plans and specifications may be obtained at the office of the superintendent or at the office of Arthur B. Fels, engineer, 60 Union Street, Portland, Maine.

DUMMERSTON, VT.—The installation of an electric-lighting system in Dummerston is under consideration. It is proposed to secure electricity from the transmission lines of the Connecticut River Pwr. Co., of Brattleboro. The cost of erecting the line is estimated at $3,500.

GREENSBORO, VT.—Surveys and estimates have been made for a 200-hp development in Greensboro, to cost $20,000. The plant will supply electricity in the villages of Greensboro, East Hardwick, Craftsbury and Mill Village. M. L. Sanders, of White River Junction, is engineer.

BOSTON, MASS.—Merchants of Tremont Row and Howard Street have formed the Scollay Merchants' Association and have entered into a contract with the Somerset Co. to furnish electricity for lighting several of the stores and also for ornamental street lamps. Standards will be erected from Pemberton Square to Somerset Street on Howard Street.

HOLLIS, MASS.—An electric company backed by the Connecticut River Pwr. Co., of Brattleboro, Vt., has submitted a proposal to supply electricity for lamps and motors in the town of Hollis.

MANCHESTER, MASS. — Arrangements are being made by the Manchester El. Co. to erect a new cable the entire distance from the Manchester-Beverly line to the electric power station on Summer Street, at a cost of about $5,000.

PITTSFIELD, MASS.—A special committee has been appointed by Mayor P. J. Moore to inspect the old Van Sickler property in Appleton Avenue on the banks of the Housatonic River, consisting of mill buildings of stone, which have recently been remodeled, a dam across the river, a turbine and three acres of land, with a view to purchasing the property for use as a power house to furnish power to the city pumping station and also to be used as a substation for electricity which may be purchased from a transmission company in the northern part of the State. The price to the city is given as $35,000.

NARRAGANSETT PIER, R. I.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Oct. 7 for construction, complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Narragansett Pier. Drawings and specifications may be obtained at the above office or from the custodian of site. O. Wenderoth is supervising architect.

PROVIDENCE, R. I.—Right-of-way has been acquired by the Rhode Island Co., of Providence, for the erection of transmission lines over Cherry Hill Avenue from the Providence & Danielson Railway through Hartford Road, Olneyville Terrace and Manton Heights.

WESTERLY, R. I.—The Westerly Lt. & Pwr. Co. expects to erect within the next six months a substation (step-up) near Westerly, to supply electricity in Watch Hill, Pleasant View and Weekapaugh, R. I. M. H. Spellman is general manager.

Middle Atlantic

CAZENOVIA, N. Y.—The Cazenovia El. Co. is contemplating an extension of its underground 2200-volt transmission system and also of its 104/208-volt secondary distribution system, amounting to a total of 5000 ft. of cable and duct, in the near future. Henry Burden is president.

COBLESKILL, N. Y.—The Courter El. Co., of Cobleskill, expects to erect at once additional coal pockets with elevators. C. H. Borst is manager.

DANSVILLE, N. Y.—Arrangements are being made by the Dansville Board of Trade for the installation of an ornamental lighting system on Main Street.

GROTON, N. Y.—The Board of Water and Light Commissioners expects to install within the next 30 days two new boilers (which have already been purchased) to replace old ones in the municipal electric-light plant. C. O. Rhodes is clerk.

ILION, N. Y.—The Electric Light Commission has entered into a five-year contract with the Utica Gas & El. Co. (with the privilege of renewal for five years) to furnish electricity to operate the municipal electric-light system, to take effect Oct. 1.

ITHACA, N. Y.—The contract for additions and alterations to the power house of the Ithaca Trac. Corpn. has been awarded to Fred T. Ley & Co., of Springfield, Mass. The cost is estimated at about $30,000. Ford, Bacon & Davis, of New York, N. Y., are engineers.

NEW YORK, N. Y.—Bids will be received by the Board of Trustees of the Bellevue and Allied Hospitals Department of New York, Bellevue Hospital, 415 East Twenty-sixth Street, New York, until Sept. 15 for furnishing and installing all electric and gas fixtures in the nurses' home, Harlem Hospital, on 136th Street, between Fifth and Lenox Avenues. Blank forms and further information may be obtained at the office of the contract clerk and auditor, 400 East Twenty-ninth Street, New York.

WATERLOO, N. Y.—The Tracy Development Co., of Waterloo, which has acquired most of the water rights along the Seneca River, has closed a contract with the Locker Construction Co. for construction of buildings for an electric power plant, at $98,540. This contract does not include machinery or equipment.

ALLENTOWN, PA.—The directors of the Consolidated Tel. Co. of Pennsylvania have approved plans for the installation of new plants at Carbondale, Oliphant and Jermyn, at a cost of $39,312; a new repair shop is to be erected at Hazleton, to cost about $2,600, and improvements will be made to the exchange at Reading, at a cost of about $10,479. The company has also decided to rebuild the system in Allentown. The total cost of improvements contemplated by the company is estimated at $400,000.

FREEMANSBURG, PA.—The Freemansburg El. & Pwr. Co. has been granted a franchise to install and operate an electric-light plant in Freemansburg. Provision, it is understood, has been made for street-lighting service.

JOHNSONBURG, PA.—The property of the Johnsonburg Lt. & Pwr. Co. has been purchased by George J. Kaebler, of Rochester, representing a syndicate which has secured options on the electric plants in Kane, St. Mary's and Ridgway. The syndicate, it is understood, purposes to build two power plants to supply electricity to all towns between Kane and St. Mary's. One plant will be erected in Kane and the other in the vicinity of Ridgway.

LANSFORD, PA.—Plans have been prepared by Jacob & Weishampel, of Allentown, for a power station for the Panther Valley Lt., Ht. & Pwr. Co., of Lansford, to cost about $7,000. G. M. Davis is president.

LEWISTOWN, PA.—Investigations are being made by the Municipal Council with a view of establishing a municipal electric-light plant in Lewistown. The matter will be submitted to the voters at the November election. The cost of the plant is estimated at about $70,000.

NEW SEWICKLEY, PA.—An application will be made to the State Department for a charter by L. C. Lamb, H. L. Mitchell and R. M. Evans for a company to generate and distribute electricity for lamps, heat and motors in New Sewickley Township. New Sewickley has not a post office.

PHILADELPHIA, PA.—Bids will be received by the committee on property of the Board of Public Education, Room 292, City Hall, Philadelphia, until Sept. 15, for alterations and additions to heating and lighting systems at various schools, in accordance with plans and specifications on file at the office of the superintendent of buildings, Room 2242, Land Title Building, Philadelphia, where blank forms of proposals may be obtained.

ROSSITER, PA.—The Public Service Commission has given its approval of the incorporation of the Rossiter El. Co., of Canoe Township, Indian Township.

SHAMOKIN, PA.—The Penn Ltg. Co., of Shamokin, expects to erect within the next three months 6 miles of single-phase, 2300-volt transmission line. J. A. Britton is general manager.

YORK, PA.—The Edison Lt. & Pwr. Co., the Merchants' El. Lt., Ht. & Pwr. Co., the Lower Windsor Township Lt., Ht. & Pwr. Co., the Spring Grove Lt., Ht. & Pwr. Co., the Jackson Township Lt., Ht. & Pwr. Co. and the Heidelberg Township Lt., Ht. & Pwr. Co. will be consolidated under the name of the Edison Lt. & Pwr. Co., provided the application for the merger is granted by the Public Service Commission. The last four companies are now applying for charters. They were organized recently by the Edison company and have secured or are seeking franchises in their districts.

YORK, PA.—Bids will be received by the board of school directors of the school district of the city of York for construction, plumbing, drainage system, electric-lighting system and heating and ventilating system for the Jackson School Building and the Madison School Building, in accordance with plans and specifications on file in the office of M. O. Lewis, superintendent of building and grounds, Central School Building. Separate bids are to be submitted on each division of the work. Bids for construction, plumbing and drainage systems and lighting system will be received by David N. Crider, secretary, Central School Building, until Sept. 14. Bids for heating and ventilating will be received at the same place until Sept. 29.

ATLANTIC CITY, N. J.—The Atlantic City El. Co., we are informed, does not contemplate any construction work whatever. Reported in the issue of Sept. 5 to have been granted a permit to erect a new power house.

IRVINGTON, N. J.—Plans are under way to submit the proposal to establish municipal electric-light and water plants to the voters at the November election. The Town Commission has authorized Harry J. Stanley, commissioner, to investigate and report on the approximate cost of a municipal electric plant.

PERTH AMBOY, N. J.—The Board of Aldermen has adopted a resolution providing for submitting the proposal to establish a municipal electric-light plant to the voters at the next general election.

TRENTON, N. J.—The contract for wiring the filtration plant for lamps and motors, and also for remodeling the wiring in the pumping station, has been awarded to the Electric Construction Co., of Trenton.

BLUEFIELD, W. VA.—The Appalachian Pwr. Co., of Bluefield, has started work on the erection of an 80,000-volt transmission line to Mullens, W. Va., a distance of 13 miles, and 5 miles of 13,000-volt distributing lines. D. M. Brown is construction superintendent.

GREGGVILLE, W. VA.—The town of Greggville has awarded the contract for the installation of an electric street-lighting system to the Stratford El. Co. Greggville has not a post office.

SISTERSVILLE, W. VA.—The Sistersville El. Lt. & Pwr. Co. is installing a 2000-hp Mesta Twyn tandem double-acting gas engine, directly connected to a 1750-kva, 60-cycle, two-phase, 2400-volt Westinghouse generator. All equipment and material for this installation has been purchased. A. M. Jones is superintendent.

RICHLANDS, VA.—The Richlands Service Corpn. is contemplating the installation of an electric plant and transmission system to furnish electricity in Richlands, Cedar Bluff, Raven and the coal-mining companies on Big and Coal Creeks.

WHITTLE, VA.—The Southern Ry. Co. has awarded the contract for construction of power house in connection with the installation of automatic signals between Amhert and Whittle to I. C. Abbot, of Brandy, Va. B. Herman, of Washington, D. C., is chief engineer of the railway company.

WISE, VA.—The Norton Lt. & Pwr. Co., which owns the local electric-light plant, is erecting a transmission line from Norton and when completed will furnish electricity from its plant in Norton to operate the local system. The power house in Wise will be dismantled.

WASHINGTON, D. C.—Bids will be received at the office of the public printer, Washington, D. C., until Sept. 16 for changes to two 600-kw generators in the power plant of the Government Printing Office, Washington. For further information address Cornelius Ford, public printer.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Oct. 3 for shipbuilding cranes at the United States navy yards, Boston, Mass., and Philadelphia, Pa. Plans and specifications may be obtained on application to the bureau or to the commandants of the navy yards named. H. R. Stanford is chief of bureau.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Sept. 29, for supplies to be delivered at various navy yards and naval stations as follows: Brooklyn, N. Y., Schedule 7276—ten 24-in. parabolic searchlight mirrors, 7300 lb. rolled soft flat-sheet copper; Schedule 7281—two electrical rotating and hoisting equipments for boat cranes; Schedule 7282—one set motor-driven bending plate rolls, to bend ¼-in. plate to circle

8 in. in diameter, 60 in. long; Schedule 7272—660 ft. 6-in. wrought-iron pipe, standard and commercial lengths, threaded both sides, miscellaneous tees and elbows, screws, cast-iron bushings, flanges and couplings. Washington, D. C., Schedule 7295—one universal 24-in. shaping machine complete; Schedule 7273—2000 lb. drawn seamless brass tubing (6½ in. inside diameter, 7¼ in. outside diameter, 20½ in. long). Newport, R. I., Schedule 7273—525 lb. hard-drawn, round-rod brass and rod and sheet copper, 4700 lb. hard-drawn seamless brass tubing, 8-ft. to 12-ft. lengths, 1200 lb. seamless copper tubing, 600 lb. seamless bronze phosphor tubing, 8-ft. to 12-ft. lengths. Bids will also be received at the same place until Oct. 6 as follows: Brooklyn, N. Y., and Mare Island, Cal., Schedule 7287—miscellaneous glass and storage-battery hydrometers, rubber syringe bulbs, glass syringe tubes. Mare Island, Cal., Schedule 7285—7100 ft. paper-insulated, single-conductor, lead-sheathed cable, 1100 ft. paper-insulated, two-conductor, lead-sheathed cable, 20 terminals for single and two-conductor cable. Bids will also be received at the same place until Oct. 13 for the following: Brooklyn, N. Y., Schedule 7291—for furnishing and installing miscellaneous refrigerating apparatus. Mare Island, Cal., Schedule 7301—eight motor-driven (convertible type) fans. Bids will also be received until Oct. 20 for miscellaneous globes, sockets, receptacles, insulators, caps, lamps and sleeves to be delivered at Pearl Harbor, Hawaii, San Francisco, Cal., or New York, N. Y., as per Schedule 7280. Applications for proposals should designate the schedule desired by number.

WASHINGTON BARRACKS, D. C.—Bids will be received at the engineer depot, United States Army, Washington Barracks, D. C., until Sept. 16 for furnishing 100 cable racks with foot and 100 without foot. For further information address Joseph E. Kuhn, Lt. Col. of Engineers.

WASHINGTON BARRACKS, D. C.—Bids will be received at the engineer depot, United States Army, Washington, D. C., until Sept. 15 for furnishing two four-circuit, 250-volt panel boxes, eight 125-volt panel boxes, eight six-circuit, 125-volt, eight eight-circuit, 125-volt, eight ten-circuit, 125-volt, and 500 extra 125-volt, 10-amp fuses. For further information address Joseph E. Kuhn, Lt. Col. of Engineers.

North Central

BATTLE CREEK, MICH.—New bids will be asked for the ornamental lamp standards to be erected on West Main Street and Washington Avenue. Sufficient funds have been raised to provide for the extension on West Main Street and Jefferson Avenue, at $100 per standard, the price originally paid when the lamps were installed on Main Street. Recent bids submitted are considerably above that amount.

HAMTRAMCK, MICH.—Contracts have been awarded by the City Council to the Peninsular El. Lt. Co. for the installation and maintenance of a new lighting system on Joseph Campau Avenue from the southern village limits to Caniff Road. Incandescent lamps of 100 cp will be used and will cost about $6,500.

POTTERVILLE, MICH.—The Council is considering a proposal submitted by L. R. Peck, of St. John, Mich., for the installation of an electric-light plant in Potterville.

RAISINVILLE, MICH.—The River Basin Hydro-Electric Co., recently incorporated, is installing an electric-light plant. The equipment will include three 50-in. Leffel-Samson waterwheels, Woodward waterwheel governors and one 100-kva El. Machinery Co. generator. The distributing system will require from 8 to 10 miles of wire. W. H. Knapp, of Monroe, is engineer in charge of the work.

SUTTONS BAY, MICH. — Several changes, it is reported, have been authorized to the local electric-light plant by W. E. Flickenger, engineer of the Michigan Inspection Bureau, which will be carried out.

CEDARVILLE, OHIO.—Within the next six months the Cedarville Lt. & Pwr. Co. expects to purchase one 150-hp to 200-hp steam engine. O. L. Smith is secretary and treasurer.

CINCINNATI, OHIO.—An ordinance has been introduced in the City Council granting the Diamond Ltg. Co. a franchise to maintain conduits through Hatters Alley, Fountain Place and Thorpe Alley.

CINCINNATI, OHIO—The installation of an ornamental lighting system on the upper and the central business sections of Vine Street is being considered by the Central Vine Street Business Association. Silas Waters is president of the association.

CLEVELAND, OHIO.—The Continental Gas & El. Corpn., of Cleveland, Ohio, has acquired the properties formerly controlled by the Iowa-Nebraska Pub. Ser. Co. and the Iowa Gas & El. Co. The two companies supply 12 towns in Iowa and Nebraska with gas and electrical service, and $250,000 has been appropriated for improvements and betterments to the properties. The Continental Gas & El. Corpn. now operates in 45 towns in Iowa and Nebraska.

COSHOCTON, OHIO.—The Ohio Service Co., of Cochocton, has applied to the Public Utilities Commission for permission to issue $630,000 in bonds for use in purchasing a number of electric and gas properties in small Ohio towns.

LEIPSIC, OHIO.—The Leipsic El. Lt. Co. expects to erect within the next 30 days four arc lamps and four 100-cp incandescent lamps and to purchase three 10-kw transformers; also within the next eight months to purchase one 350-hp water-tube boiler. J. W. Cottingham is owner and manager.

MARTINSVILLE, OHIO.—The Wilmington Wtr. & Lt. Co., of Wilmington, has submitted a proposal to the Village Council to extend its transmission lines to Martinsville to furnish electricity for lighting the streets of the village and for domestic and commercial purposes. F. C. Jeannot is superintendent of the Wilmington company.

PORTSMOUTH, OHIO.—The City Council is contemplating the installation of electric street lamps in a suburb of the city which is now without street-lighting service.

PORT CLINTON, OHIO.—The City Council has awarded the contract for street lighting to the Port Clinton El. Lt. & Pwr. Co. for a period of 10 years. Under the terms of the contract the company is to install an ornamental street-lighting system and many additional lamps will be erected throughout the city.

WILMINGTON, OHIO.—The Clinton Tel. Co., of Wilmington, has applied to the State Utilities Commission for permission to issue $50,000 in bonds, of which the proceeds of $20,000 will be used for the construction of a new office building in Wilmington, $22,000 for a new switchboard and other exchange equipment and improvements to its system here, and $8,000 for improvements to its system in Sabina.

YOUNGSTOWN, OHIO. — Transformers and other equipment, besides considerable other apparatus, was destroyed by fire at the Lowellville station of the Mahoning & Shanango Ry. & Lt. Co., of Youngstown. The equipment will be replaced at once.

BEATTYVILLE, KY.—A 20-year franchise to supply electricity in Beattyville is offered for sale by the city officials, bids for which are now being received by R. B. Jackson, Mayor.

CORBIN, KY.—The proposal to issue $15,000 in bonds for the purchase of the property of the Home El. Lt. Co., of Corbin, will be submitted to the voters at the November election.

IRVINE, KY.—The installation of an electric-light plant in Irvine is under consideration. Clyde Gaines is interested in the project.

ARGOS, IND.—The town of Argos is now installing a street-lighting system. C. E. Vandorn is superintendent.

FORT WAYNE, IND.—Plans are being considered to erect ornamental lamps on the new St. Joe Boulevard Dike when completed, from Columbia Street bridge north.

MADISON, IND.—The Public Service Commission has granted the Madison Lt. & Ry. Co. permission to issue $25,000 in bonds for extensions and improvements to its system, including the installation of new boilers, an engine and generator and extensions to local lines. The company is now erecting a transmission line to Hanover to furnish electricity to operate the system of the Hanover Lt. Co.

MUNCIE, IND.—The City Council is considering the installation of an ornamental lighting system in the business district.

ELMWOOD, ILL.—Plans are being prepared for a municipal electric plant in Elmwood by L. W. Lemon, of Clinton, engineer.

PATOKA, ILL.—A movement has been started to establish an electric-light and power plant in Patoka.

ROCK FALLS, ILL.—The Public Service Commission has granted the Illinois Northern Utilities Co., of Dixon, permission to purchase the electric plant, equipment and franchise of the Northwestern Barb Wire Co. at Rock Falls.

ROCK ISLAND, ILL.—Application has been made to the City Council by the Central Union Tel. Co. for permission to install underground conduits on the Seventh Avenue Boulevard between Thirtieth and Forty-sixth Streets and on Eighteenth Street from the alley between First and Second Avenues to the river.

CLINTONVILLE, WIS.—Within the next three months the water and light committee expects to purchase one 12-in. by 36-in., or 12-in. by 30-in., simple Corliss engine, with double-eccentric valve gear. George C. Stewart is superintendent.

ENDEAVOR, WIS.—The Endeavor Lt. & Pwr. Co. expects to purchase within the next few months an oil engine. William H. Burwell is manager.

FREDERIC, WIS.—G. F. Grink, of Frederic, is planning to build a 100-hp electric plant and erect a 9-mile transmission line into Frederic this fall.

MAUSTON, WIS.—The Mauston El. Ser. Co. expects to purchase within the next six months one waterwheel governor. J. E. Carroll is manager.

MONDOVI, WIS.—Plans are being prepared, it is reported, by C. A. Dornfeldt, of Kenosha, for rebuilding the local electric-light plant.

TWO RIVERS, WIS.—The electric light commissioners are contemplating the installation of an ornamental street-lighting system in the business section of the city.

WAUSAU, WIS.—Extensions to the ornamental street-lighting system are reported to be under consideration.

DULUTH, MINN.—The cost of building an electric substation in West Duluth that would supply that section of the city and other adjacent sections is estimated at $90,000 by Commissioner Merritt. This estimate was made for the commissioner to use in illustrating what can be done toward building a municipal electric-light plant for the entire city in case the Duluth Edison Co. refuses the offer of $1,107,940 for its property and franchises.

KENYON, MINN.—The Kenyon Lt. & Pwr. Co. has entered into a contract with the Consumers' Pwr. Co., Faribault, for the purchase of energy for a period of ten years. The Consumers' Pwr. Co. will erect a transmission line (10 miles long) from the Faribault division to reach the point of delivery, and the local company will distribute same. When changes are completed a 24-hour service will be established.

MOORHEAD, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Louis, until Sept. 22 for construction of classroom building for the State Normal School at Moorhead, including general contract work, heating and ventilating, plumbing and electrical work, in accordance with plans and specifications prepared by C. H. Johnston, architect, Capital Bank Building, St. Paul. Separate bids to be submitted on each division of the work.

GRUNDY CENTER, IA.—The new building (74 ft. by 64 ft., cement block and hollow tile), to replace the power station of the local electric-light plant, recently burned, is nearly completed, and all the equipment except a 125-kva alternator has been purchased. Two of the boilers of the old plant were saved and will be used. The new coal bin will have a capacity of 250 tons. J. B. Calderwood is owner and manager.

GLASGOW, MO.—The contract for erecting a transmission line from Glasgow to Armstrong, Mo., has been awarded by Tuttle & Pike, consulting engineers, Kansas City, Mo., to F. H. Wheeler, of Omaha, Neb., at $5,626.

ST. LOUIS, MO.—Plans are being considered by the West End Business Men's Association for the illumination of Franklin Avenue from Twelfth Street to Beaumont. It is proposed to install arc lamps.

ALEXANDRIA, S. D.—Bids will be received at the office of H. M. Schumacher, city auditor, Alexandria, until Oct. 5 for furnishing and installing complete a municipal electric-lighting system. K. S. Putnam, of Huron, S. D., is consulting engineer. For details see proposal columns.

DALLAS, S. D.—The B. H. Martin El. Lt. & Pwr. Co., of Dallas, expects to purchase within the next 30 days a waterwheel (to utilize 4000 gal. of water per minute under a 160-ft. fall), one 30-kw, direct-current generator, 20-hp motor and hydraulic pump and wiring supplies. B. H. Martin is president.

LEAVENWORTH, KAN.—The city commissioners have signed a contract with the Leavenworth Lt., Ht. & Pwr. Co. for the installation of an ornamental lighting system on Delaware Street. The contract provides for the erection of 70 standards carrying five-lamp clusters.

PEABODY, KAN.—The Peabody Lt. & Pwr. Co., it is reported, is contemplating the installation of an ice-manufacturing plant. R. D. Sands is president and manager of the company.

Southern States

HAZLEWOOD, N. C.—The town of Hazlewood is contemplating issuing $15,000 in water, light and sewer bonds.

HIGH POINT, N. C.—Within the next three months the Electric Light Commission expects to purchase wire, insulators and transformers to change lines from Main Street on account of the ornamental street-lighting system to be installed on Main Street by the North Carolina Pub. Ser. Co. O. E. Stuart is superintendent.

SALUDA, N. C.—The city of Saluda is contemplating the installation of a water, light and sewer system, for which $10,000 in bonds have been issued.

WINTON, N. C.—The contract for installation of a municipal electric-light plant is reported to have been awarded to the J. W. Smith El. Co., of Winton. The plant will be driven by steam power; later the town proposes to develop water-power and enlarge plant.

WALTERBORO, S. C.—A petition has been presented to the Town Council asking that an election be held to submit to the voters the proposal to issue $15,000 in bonds for the purpose of installing a municipal electric-light plant.

ATLANTA, GA.—Bids will be received at the office of the superintendent of prisons, Department of Justice, Washington, D. C., until Sept. 24 for furnishing and delivering elevator equipment for the hospital building at the United States penitentiary at Atlanta, Ga., in accordance with plans and specifications, copies of which may be obtained at the above office. F. H. Duehay is superintendent.

AUGUSTA, GA.—Bids will be received by the special hospital building committee of the City Council of Augusta until Sept. 25 (extension of date) for furnishing and installing X-ray apparatus at the University Hospitals in Augusta. Specifications may be obtained upon application to W. C. Lyle, M.D., vice-dean.

CRAWFORDVILLE, GA.—J. A. Ingram, of the Modern Equipment Co., it is reported, has submitted a proposal to the City Council to install an electric-light plant, to cost about $4,000.

PAVO, GA.—The contract for construction of the proposed municipal electric-light plant has been awarded to the J. B. McCrary Co., engineer, of Atlanta.

SYCAMORE, GA.—The City Council has awarded a contract for the installation of an electric-lighting system in Sycamore.

FORT MEADE, FLA.—Bonds to the amount of $25,000 have been voted for the installation of a municipal electric-light plant.

HOMESTEAD, FLA.—The City Council is considering the question of asking the State Legislature for permission to issue $50,000 in bonds to construct an electric-light plant, water-works system, etc.

KEY WEST, FLA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Sept. 26 for furnishing and erecting one 200-hp water-tube boiler, with setting, stack and accessories, at the naval station, Key West, Fla. Plans and specifications may be obtained on application to the bureau or to the commandant of the navy yard named. H. R. Stanford is chief of bureau.

MACCLENNY, FLA.—The Council is considering the question of submitting the proposal to issue bonds to install an electric-light plant and water-works system to the voters.

PABLO BEACH, FLA.—At an election held Sept. 15 the proposal to issue $15,000 in bonds to establish a municipal electric-light plant will be submitted to the voters. J. M. Mier is town clerk.

SEVIERVILLE, TENN.—The Walker Milling & Produce Co., which is building a concrete dam at its mill, 2 miles east of Sevierville, will, it is understood, install an electric plant and furnish electricity for lighting the town. Preparations are now being made to wire the town for electric lamps.

MERIDIAN, MISS.—Bids will be received by R. L. Blanks, city clerk and treasurer of the city of Meridian, until Sept. 22 for the construction of a new city hall. Copies of plans and specifications may be obtained from P. J. Krouse, architect, Meridian, for which a deposit of $25 will be required, to be refunded upon return of same.

PINEVILLE, LA.—Plans are being considered by the State Board of Control, Baton Rouge, for the installation of a power plant at the State Insane Asylum, plans for which are being prepared by Favrot & Livaudais, of New Orleans.

MUSKOGEE, OKLA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Sept. 29, for the installation complete of an electric passenger elevator in the United States post office and court house at Muskogee. For details see proposal columns.

POND CREEK, OKLA.—Within the next three months the city of Pond Creek expects to purchase one 50-kva generator and exciter, one 50-hp internal-combustion engine, two 20-hp single-phase motors and two centrifugal pumps for the municipal electric-light plant; also to erect about 1½ miles of transmission line. C. C. Shepard is city superintendent.

AUSTIN, TEX.—The City Council has appropriated $4,000 for the purpose of laying conduits in which the electric-light cables will be placed in the nearest parallel alley between Seventh and Tenth Streets. The Council is also contemplating placing all wires along the alleys south of Seventh Street to Fifth Street, and from the power house along West Avenue to Fifth Avenue, later on, the cost of which is estimated at $20,000.

DALLAS, TEX.—Negotiations have been closed between the Texas Pwr. & Lt. Co. and the Texas Trac. Co., under the terms of which the Texas Pwr. & Lt. Co. will furnish energy to operate the traction system and has leased the electric generating plant of the traction company at McKinney. Transmission lines will be erected to connect the present transmission system of the Texas Pwr. & Lt. Co. with a northern group of towns served by the company. Work will also soon be started on the new generating station on the Oklahoma side of the Red River.

EASTLAND, TEX.—The Eastland Lt. & Pwr. Co. has recently installed a 50-hp internal-combustion engine. Allen D. Dabney is president.

FORT STOCKTON, TEX.—The Fort Stockton Lt. & Pwr. Co. expects to install an internal-combustion engine to replace the steam engine now in use within the next six months. E. F. Woodruff is manager.

GREENVILLE, TEX.—The Greenville, Whitewright & Northern Trac. Co. has amended its charter, changing its name to the Greenville & Northwestern Ry. Co. Plans for construction of the proposed railway, including erection of power plant, are well under way.

Pacific States

CATHLAMET, WASH.—Steps have been taken for the installation of a municipal electric-light plant in Cathalmet. The initial installation provides for an engine-driven unit to cost about $5,000. Eventually it is proposed to utilize the water-power of the Elocamen River, near here, to operate the plant.

PUYALLUP, WASH.—The County Commissioners of Pierce County have granted the Mutual El. Lt. & Pwr. Co., recently organized with a capital stock of $25,000, a franchise to erect electric transmission lines and telephone lines on the county roads. The company will supply electricity to the farmers on the south side of the Puyallup River between Tacoma and Puyallup.

SEATTLE, WASH.—The city utilities committee of the City Council has authorized an appropriation of $5,000 from the city light funds to be used in investigating and surveying the proposed power project on Lake Cushman.

SEATTLE, WASH.—The Commissioners of King County have granted the city of Seattle permission to extend the transmission lines of the municipal electric-light system from Bryn Mawr to Renton, and along the line of the State Aid Road No. 7, same being the continuation of Ranier Boulevard.

SHERIDAN, ORE.—The Sheridan Lt. & Pwr. Co. has just completed the erection of a 5-mile transmission line connecting Sheridan and Willamina. The company will also furnish electricity to farmers residing along the line. J. F. Thompson is general manager.

SUMMERVILLE, ORE.—The Klees El. Co., of Summerville, will let contract for 2000 ft. of pipe line this fall. The company is now erecting 7 miles of 6600-volt, three-phase pole transmission line. It will also install a 20-in. waterwheel this year. C. E. Boggs is engineer.

REDDING, CAL.—The substation of the Northern California Pwr. Co. at Redding was destroyed by fire on Aug. 28, leaving the city without light, power and water service.

SAN DIEGO, CAL.—The San Diego Consol. Gas & El. Co. expects to purchase within the next few months (through the Chicago office of H. M. Byllesby & Co.) three 1000-kva, 2300/11,000-volt transformers. The company is now installing two 600-hp Babcock & Wilcox water-tube boilers, one 5000-kva General Electric three-phase, 60-cycle turbo-generator, one 100-kw General Electric turbo-exciter, and one 500-kw, 600-volt, direct-current motor-generator set. L. M. Klauber is superintendent of electric department.

TAYLORSVILLE, CAL.—The California Water Power Commission has granted the Engels Copper Mining Co., which is operating extensive copper deposits in Lights Canyon near Taylorsville, permission to develop a hydroelectric power plant on Lights Creek, utilizing 60 second-ft. of water. Electricity generated at the plant will be used to operate the machinery at the mines.

LEWISTON, IDAHO.—A survey has been made of the Clearwater River by J. W. Morris, of Portland, Ore., with a view of constructing a hydroelectric power plant for the city of Lewiston. As yet Mr. Morris' report has not been submitted. E. G. Wagner is superintendent of the water-works system.

WALLACE, IDAHO.—Surveys are being made by George H. Potter and Arthur C. Pratt, engineers, of the Montana Pwr. Co., of Butte, Mont., for the erection of a new high-tension transmission line from Wallace to connect with the main line of the Chicago, Milwaukee & Puget Sound Railway at some place near Mullan.

MANTI, UTAH.—The city of Manti has recently installed an ornamental lighting system on Main Street. The poles are set four to the block, mounted with 60-cp tungsten lamps, with 100-cp lamps at each cross-street. Within the next two months the city expects to purchase one or two transformers from the Capital El. Co., of Salt Lake City. George Brox, manager.

SALT LAKE CITY, UTAH.—The Utah Pwr. & Lt. Co. of Salt Lake City, has applied to the City Commission for authority to take over the Utah Lt. & Rys. Co., which owns and operates the street railway and electric light and power systems of Salt Lake City and adjoining towns, and also the gas and electric light and power systems in Ogden. The Salt Lake Lt. & Trac. Co., recently incorporated with a nominal capital stock of $1,000,000, will take over the property and franchises of the Utah Lt. & Rys. Co.

HIGLEY, ARIZ.—Arrangements are being made by the Chandler Improvement Co. for the installation of an electric plant in Higley to supply electricity to pump water for irrigating purposes. J. T. Germann, of Higley, is reported interested in the project.

JEROME, ARIZ.—The American Hydraulic Pwr. Co. has applied to the Corporation Commission for permission to issue $2,000,000 in bonds for the construction of a larger plant on the Upper Verde River. It is understood that transmission lines from the new plant will reach many communities in this vicinity and will furnish energy to a number of mines and also for pumping water for irrigation purposes in the valleys north.

NOGALES, ARIZ.—The International Gas Co., of Nogales, is contemplating the installation of an electric plant to supply electricity for lamps and motors in this city and also in Nogales in Sonora, Mexico; also to furnish energy for a large pumping irrigation project in that vicinity. An ice factory is also included in the project. The company has applied to the corporation commission for permission to issue stocks and bonds amounting to approximately $300,000. Spiro S. Proto, of Nogales, is president of the company.

SIDNEY, MONT.—The Glendive Ht., Lt. & Pwr. Co., of Glendive, has applied to the City Council for a franchise to install an electric-light system in Sidney.

WHITE OAKS, N. M.—The Wild Cat Mining Co., of White Oaks, is contemplating the construction of an electric power plant and the erection of transmission lines to its mines in Nogal Canyon and to Carrizoza. A. B. Graham, J. H. Fulmar, Jr., of Mishawka, Ind., and others, are interested in the company.

Canada

BRANTFORD, ONT.—Tenders will be received until Sept. 16 for the installation of an electric passenger elevator, including motor-generator set, etc., in a public building in Brantford. Plans and specifications may be obtained from the Department of Public Works, Ottawa. E. C. Desrochers is secretary.

Miscellaneous

MELBOURNE, AUSTRALIA.—Bids will be received by Peter McBride, agent general for Victoria, Melbourne Place, Strand, London, W. C., England, until Oct. 14 for furnishing and delivering at the port of Melbourne supplies as follows: Contract No. 25,823—low-tension headgear and instruments; Contract No. 26,108—low-tension cables; Contract No. 26,111—fuse distribution boxes and fuses. Specifications, etc., may be obtained on application to John Coates & Co., Ltd., consulting engineers, 115 Victoria Street, London, S. W., England. For details see proposal columns.

New Incorporations

ALAMEDA, CAL.—The Mountain Lt. & Wtr. Co. has been incorporated with a capital stock of $25,000. The directors are: J. F. Hughes, M. J. Russell and Grace L. Stillwell.

PEABODY, KAN.—The Peabody Lt., Ht. & Pwr. Co. has been chartered with a capital stock of $20,000.

LEWISTOWN, MONT.—The Polmar El. Co. has been incorporated with a capital stock of $10,000 by Ray R. Polson, W. J. Dittmar and Harry A. Polson, all of Lewistown.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED SEPT. 1, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,108,883. BATTERY CONNECTIONS; J. Bijur, New York, N. Y. App. filed Sept. 6, 1913. Particularly for storage batteries.

1,108,886. SYSTEM OF DISTRIBUTION; F. Conrad, Pittsburgh, Pa. App. filed June 6, 1911. Storage-battery charging.

1,108,890. OVEN; R. W. Davenport, Detroit, Mich. App. filed Nov. 25, 1912. Multiple chamber electric heater.

1,108,892. IGNITION COIL; E. Eisemann, Stuttgart, Germany. App. filed Nov. 9, 1911. Resistance in the primary circuit.

1,108,895. SIGNALING BY SOUND AND OTHER LONGITUDINAL ELASTIC IMPULSES; R. A. Fessenden, Brookline, Mass. App. filed Jan. 10, 1914. For submarine work.

1,108,905. MOTOR CONTROLLER; C. T. Henderson, Milwaukee, Wis. App. filed April 23, 1909. Automatic acceleration.

1,108,907. MOTOR CONTROLLER; A. J. Horton, White Plains, N. Y. App. filed July 6, 1908. Adjustable maximum.

1,108,919. HEATER; F. F. Long, Campbellford, Ontario, Canada. App. filed May 13, 1913. For candy-making, etc.

1,108,924. ELECTRIC FURNACE; J. W. Moffat, Toronto, Ontario, Canada. App. filed Nov. 22, 1913. Reduction chamber and tilting crucible.

1108,927. ELECTRIC SIGNALING SYSTEM; C. P. Nachod, Philadelphia, Pa. App. filed Feb. 25, 1910. Block system for electric railways.

1,108,931. SYSTEM OF ELECTRICAL DISTRIBUTION; J. S. Peck, Manchester, Eng. App. filed Oct. 2, 1909. Polyphase alternating current.

1,108,934. TEMPERATURE INDICATOR; M. C. Rypinski, Braddock, Pa. App. filed Jan. 5, 1907. Differential resistance.

1,108,940. COLLECTOR RING; C. W. Starker, Pittsburgh, Pa. App. filed Dec. 6, 1912. Insulation.

1,108,998. SIGNALING SYSTEM; M. Levison, Chicago, Ill. App. filed April 15, 1911. Annunciator system for hospitals, etc.

1,109,016. COUPLING; G. A. Quin, Toronto, Ontario, Canada. App. filed Feb. 24, 1913. Conduit fishing.

1,109,034. SEALING-WAX-APPLYING DEVICE; B. Bryan, Washington, D. C. App. filed June 17, 1912. Electric heater.

1,109,036. ELECTRIC FUSE; P. C. Burns, Chicago, Ill. App. filed Sept. 14, 1905. Cartridge type.

1,109,037. MOUTHPIECE ATTACHMENT FOR TELEPHONE TRANSMITTERS; P. C. Burns, Chicago, Ill. App. filed Aug. 12, 1909. Glass with attachment.

1,109,058. INSULATOR; O. J. Fritz, Weisenburg, Pa. App. filed Aug. 23, 1913. Slotted-pole-line type.

1,109,064. IGNITION APPARATUS; P. H. Hawker and I. J. Reutter, Anderson, Ind. App. filed Dec. 2, 1912. Regulating resistance.

1,109,091. TIME-LIMIT CONTROL FOR CIRCUIT-BREAKERS; C. S. Van Nuis, New Brunswick, N. J. App. filed Feb. 19, 1909. Retarding device with a reservoir and float.

1,109,111. TELEPHONE SYSTEM; O. Coleman, Wawanesa, Manitoba, Canada. App. filed April 8, 1912. Party-line selective calling.

1,109,128. GALVANIC CELL; M. L. Kaplan, Brooklyn, N. Y. App. filed Jan. 27, 1914. Depolarizing hydrated manganite.

1,109,129. GALVANIC CELL; M. L. Kaplan, Brooklyn, N. Y. App. filed June 1, 1914. Depolarizing manganous polymanganite.

1,109,163. TELEPHONE-EXCHANGE SYSTEM; E. R. Corwin, Chicago, Ill. App. filed Aug. 10, 1912. Electromagnetic extensions.

1,109,164. TELEPHONE-EXCHANGE SYSTEM; E. R. Corwin, Chicago, Ill. App. filed Aug. 10, 1912. Common selector switches.

1,109,165. TELEPHONE-EXCHANGE SYSTEM; M. L. Johnson, Chicago, Ill. App. filed Aug. 10, 1912. Condition signal.

1,109,166. TELEPHONY; M. L. Johnson, Chicago, Ill. App. filed Oct. 9, 1912. Semi-automatic extension.

1,109,167. TELEPHONY; M. L. Johnson, Chicago, Ill. App. filed Oct. 9, 1912. Semi-automatic.

1,109,181. ELECTROGALVANIZING SOLUTION; G. Sacerdote, New York, N. Y. App. filed July 21, 1909. Includes salts of aluminum and manganese with acetic acid.

1,109,205. STATIC ELECTRIC MACHINE; J. B. Dempster, Des Moines, Ia. App. filed Oct. 9, 1911. Silica-crystal surface.

1,109,216. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; G. Grabe, Berlin, Germany. App. filed Dec. 11, 1909. Groups selector system.

1,109,234. RETRIEVING TROLLEY; C. E. Lang, Los Angeles, Cal. App. filed June 22, 1908. Automatic return.

1,109,235. CONTROL SYSTEM; H. A. Laycock, Schenectady, N. Y. App. filed Feb. 21, 1912. Voltage regulation.

1,109,236. REGULATING SYSTEM; H. A. Laycock, Schenectady, N. Y. App. filed April 28, 1913. Improvement on Tirrill vibrating contact, patent No. 726,234.

1,109,242. SIGNALING DEVICE FOR LETTER-BOXES; C. E. McIntosh and S. S. Hopkins, Waynesboro, Va. App. filed Jan. 8, 1913. Operated by lid.

1,109,244. CURRENT-REVERSING RELAY; E. J. Murphy, Schenectady, N. Y. App. filed March 5, 1913. Electromagnetic.

1,109,245. ELECTROMAGNETIC SWITCH; E. J. Murphy, Schenectady, N. Y. App. filed June 5, 1913. Mechanical construction.

1,109,310. TELEGRAPH KEY; B. B. Youmans, College Park, Ga. App. filed April 4, 1913. Equalizing resilient support.

1,109,311. METHOD AND MEANS FOR ELECTROLYZING SALINE SOLUTIONS; E. A. Allen, Rumford Falls, Maine. App. filed Jan. 6, 1912. Prevents absorption of chlorine.

1,109,325. ELECTRIC DRILL; W. O. Duntley, Chicago, Ill. App. filed May 2, 1904. Portable.

1,109,330. STABILIZING MEANS FOR ELECTRIC-ARC FURNACES; C. E. Guye, Geneva, Switzerland. App. filed Jan. 8, 1912. Coil of copper free from iron.

1,109,337. BRAKE-VALVE-CONTROLLING DEVICE FOR VEHICLES; F. T. Jones, Baltimore, Md. App. filed Dec. 27, 1912. Operated by shoe.

1,109,338. CONTROL OF ELECTRIC MOTORS AND APPARATUS THEREFOR; P. N. Jones and J. W. Welsh, Pittsburgh, Pa. App. filed Nov. 12, 1913. For vehicle drive.

1,109,381. SIGNAL SYSTEM; F. H. Webster, Marvell, Ark. App. filed Jan. 17, 1913. Visual calling signal operated on telephone circuit.

1,109,391. COLLAPSIBLE OUTLET BOX; W. J. Billings and M. P. Caffe, New York, N. Y. App. filed Aug. 15, 1912. Folding sides.

1,109,411. TELEGRAPH TRANSMITTER; R. F. Gale, Fort Wayne, Ind. App. filed Jan. 15, 1913. Automatic vibrator.

1,109,415. MINER'S LAMP; R. G. Harris, Bearden, Tenn. App. filed Dec. 13, 1913. Combined with cap.

1,109,450. TESTING LAMP AND FUSE TESTING DEVICE; C. W. Mitchell, New York, N. Y. App. filed May 8, 1912. Pocket device.

1,109,470. POST INSULATOR; J. A. Sanford, Jr., East Liverpool, Ohio. App. filed Feb. 21, 1913. Spacing elements.

1,109,472. TELEPHONIC AND TELEGRAPHIC APPARATUS; J. Schiessler, Vienna, Austria-Hungary. App. filed Aug. 19, 1908. Relay with incandescent resistance.

1,109,481. RAIN ANNUNCIATOR; J. H. Stroud, Mabel, Minn. App. filed Dec. 29, 1913. Hygroscopic element.

1,109,511. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed July 14, 1906. Automatic with relays.

1,109,534. CONTROLLING DEVICE FOR RAILWAY VEHICLES; C. Konig, Vohwinkel, Germany. App. filed Aug. 1, 1912. Indicates the movement.

1,109,536. APPARATUS FOR THE CONTROL OF ELECTRIC CIRCUITS; H. Leitner, London, Eng. App. filed May 5, 1913. Charging lighting circuits.

1,109,551. ELECTRIC RADIATOR; M. H. Shoenberg, San Francisco, Cal. App. filed Feb. 3, 1914. Reflection.

1,109,554. AUTOMATIC MUSICAL-INSTRUMENT PLAYER; I. B. Smith, Philadelphia, Pa. App. filed March 23, 1908. Electromagnetically operated piano.

1,109,565. PERFORATING MACHINE; E. H. Bickley, Detroit, Mich. App. filed Dec. 26, 1912. For motograph ribbon (see patent No. 1,050,203).

1,109,586. LINE-DISCONNECTING SWITCH; E. M. Hewlett, Schenectady, N. Y. App. filed May 5, 1909. For tower and pole work.

1,109,589. ELECTRIC-LAMP SOCKET; M. Larsen, New York. App. filed Jan. 18, 1908. Adjustable angle.

1,109,591. WELDING TOOL; S. S. Morgan, St. Charles, Mo. App. filed May 23, 1914. Portable hand tool.

1,109,592. ELECTRIC WELDING APPARATUS; S. S. Morgan, St. Charles, Mo. App. filed May 23, 1914. For attaching nails, etc.

1,109,594. ELECTRIC SWITCH; J. A. Osborn, St. Louis, Mo. App. filed June 1, 1911. For hand-welding tools such as those described in patents Nos. 1,042,467 and 1,042,468.

1,109,595. ELECTRIC SWITCH; J. A. Osborn, St. Louis, Mo. App. filed June 1, 1911. Foot-operated.

1,109,615. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed Sept. 21, 1905. Semi-automatic.

1,109,616. ELECTRICAL SIGNALING SYSTEM FOR TELEPHONE EXCHANGE; E. E. Clement, Washington, D. C. App. filed April 12, 1906. Composite.

1,109,617. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed June 23, 1906. Combination of manual and automatic (eighteen drawing sheets).

1,109,618. TELEPHONE EXCHANGE; E. E. Clement, Washington, D. C. App. filed July 20, 1906. Semi-automatic.

1,109,619. TELEPHONE-EXCHANGE SYSTEM; E. E. Clement, Washington, D. C. App. filed April 6, 1907. Automatic and manual control.

1,109,620. TELEPHONE EXCHANGE; E. E. Clement, Washington, D. C. App. filed Feb. 26, 1908. Selecting switches.

1,109,621. TELEPHONE APPARATUS; E. E. Clement, Washington, D. C. App. filed July 13, 1907. Automatic switches.

1,109,622. TELEPHONE APPARATUS AND SYSTEM; E. E. Clement, Washington, D. C. App. filed July 15, 1907. Impulse transmitter.

1,109,634. MAGNETIC ORE SEPARATOR; G. Land, Seattle, Wash. App. filed May 24, 1913. Wet system.

1,109,650. TELEPHONE-EXCHANGE SYSTEM; T. G. Martin, Chicago, Ill. App. filed June 10, 1906. Trunking apparatus (145 claims).

13,795 (reissue). SIGNALING SYSTEM; E. R. Gill, Yonkers, N. Y. App. filed Aug. 16, 1913. Original patent No. 1,019,781, dated March 12, 1912. Train dispatching.